Titan User's Guide
(OS/390 Standard System)

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National Institutes of Health
Center for Information Technology
NIH Computer Center
12 South Drive MSC 5607
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FOREWORD

The Center for Information Technology (CIT) provides and supports central computing resources for use by NIH and by a number of other government agencies. CIT operates the NIH Computer Center, comprising the OS/390 mainframe systems (Titan and South System), Unix enterprise systems (EOS), numerous Windows NT/2000 application servers, enterprise-wide e-mail services, World Wide Web services, and scientific computing resources. CIT provides interoperability among these resources and with other computing facilities.

With respect to our OS/390 processing environment, the migration of the former North System to Titan is complete. Titan now provides many of our customers an efficient, reliable, and economical OS/390 processing environment, with reduced dependence on highly customized software, allowing quicker adoption to new technologies. Over the next several years, we will make a similar transition of the South System to Titan, bringing Titan's benefits to the rest of our customers.

The name, Titan, was selected to evoke images of size and strength, qualities that characterize the mainframe. In ancient Greek mythology, the Titans (sometimes called the Elder Gods) were displaced by the Olympian Gods. Eventually both groups reconciled and lived together peacefully. Similarly, some thought that Unix systems and PCs would overthrow the mainframes, but it seems that the old and new can get along together productively.

To facilitate your use of CIT's facilities and services, we have developed the *Titan User's Guide* as the primary reference for reliable information about the new Titan system. This manual also introduces other services offered by CIT.

You are always assured of being promptly informed about recent changes to our facilities through CIT's online resources including *Interface* and the online mail facility "Titan/South System News." We are here to support you in fulfilling your organization's missions and goals. Please let us know how we can better serve you.

John Dickson, Ph.D., Director
Division of Computer System Services, CIT

1 ORIENTATION

The *Titan User's Guide* is published and maintained by the Center for Information Technology, for those who use the OS/390 Titan system of the NIH Computer Center. It describes the services, registration, standards, security-related issues (Section 4), where to go for additional information, and guidance on who to contact for assistance. The *NIH Computer Center User's Guide* describes the OS/390 South System. Refer to the manual *Batch Processing and Utilities at the NIH Computer Center* for information on batch processing and job control language (JCL) for both the Titan and South systems.

The general South System migration to Titan will begin in 2002. If you are planning to develop new South System applications, they should be developed on Titan.

Visit the CIT OS/390 systems on the Web at:

http://datacenter.cit.nih.gov

For additional information on the Titan transition refer to:

http://silk.nih.gov/silk/titan

The other components of the Enterprise Systems—the OS/390 South System, the Enterprise Open Systems (EOS), a Unix-based system for general applications, and the Windows application servers—are only briefly described in this document. Please contact the CIT Technical Assistance and Support Center (TASC) for further information about the Unix and NT platforms.

Any questions about the content or meaning of information in the *Titan User's Guide* should be directed to TASC. The location and telephone number for TASC and other important groups can be found in Section 1.3.1.

Between updates to this manual, users are informed of changes through CIT's online resources including *Interface*, a Web-based periodical, and "Titan/South System News," an online mail facility, and CIT Web pages. These resources announce changes in CIT policies and standards of service, as well as all significant modifications to hardware and software on various platforms at the NIH Computer Center. This version of the *Titan User's Guide* is updated through *Interface* Number 220, September 5, 2001.

New and prospective customers may obtain an orientation package from the Technical Information Office. For CIT publication services, visit:

http://publications.cit.nih.gov

1.1 CIT (CENTER FOR INFORMATION TECHNOLOGY)

CIT provides a variety of data processing services on a cost-recovery basis to the NIH and other government agencies, and also conducts research and development related to the application of computer methodology to biomedical research.

As part of its mission, CIT:

- provides data processing and high-performance computing facilities, integrated telecommunications data networks, and services to DHHS and other Federal agencies
- establishes and operates the necessary organization and infrastructure to assure security, connectivity, and interoperability across the NIH
- operates a state-of-the-art regional computer facility
- provides leadership for determining NIH's computational and telecommunications needs and oversees development of infrastructure support
- develops NIH information technology policy to implement policy and legislation
- provides policy and standards leadership within NIH by identifying and communicating NIH information technology issues, problems and solutions

This section briefly describes some of the components of the Center for Information Technology.

For more information on CIT visit:

http://cit.nih.gov

For a directory of useful World Wide Web addresses, see Section 6.5.2.

1.1.1 Office of the Deputy Chief Information Officer (ODCIO)

The Office of the Deputy Chief Information Officer advises the Chief Information Officer (CIO) on the direction and management of significant NIH IT program and policy activities under relevant Federal statutes, regulations and policies. It also develops, implements, manages, and oversees NIH IT activities related to IT legislation, regulations, and NIH and other Federal policies.

ODCIO directs NIH's IT capital planning processes with regard to major IT investments, and provides leadership to NIH Institutes and Centers (ICs) to enhance and strengthen their IT program management so they comply with legislative and policy requirements. The ODCIO serves as the principal NIH liaison to the DHHS, its OPDIVs, and other Federal agencies on IT matters. In addition, ODCIO identifies critical IT issues and analyzes, plans, leads, and manages the implementation of special DHHS or Federal initiatives as they relate to the management of NIH's IT resources. ODCIO also collaborates with NIH managers responsible for IT-related functions.

1.1.2 Division of Computer System Services (DCSS)

The Division of Computer System Services (DCSS) plans, implements, operates, and supports centrally owned or administered computing resources for NIH enterprise use, ensuring interoperability among those resources and between them and other computing facilities owned by customer organizations. DCSS also supports the Helix and ALW systems for NIH scientists. DCSS promotes awareness and efficient and effective use of these computing resources by customer personnel through training, presentations, consultations, and documentation.

DCSS investigates new and emerging computing requirements of customer programs. It conducts research and development to identify, evaluate, and adapt new computer architectures and technologies to meet identified customer requirements and to enhance current service offerings. Additionally, where appropriate, DCSS manages and operates departmental computing resources for IC, office, or division use.

The Division of Computer System Services administers the NIH Computer Center. DCSS also operates enterprise-wide e-mail services and World Wide Web services for NIH. Designated as a DHHS consolidated data center, the NIH Computer Center encompasses several interconnected multi-computer facilities (OS/390, Unix, and Widows NT/2000). This manual fully describes the Titan system.

1.1.2.1 Enterprise Systems

The multi-platform Enterprise Systems are composed of the OS/390 Titan system, the OS/390 South System, the Enterprise Open Systems (Unix), and the Windows application servers.

For more information on all these systems, visit:

http://datacenter.cit.nih.gov

The wide variety of services provided by the Titan computing facility is described in this manual.

The Enterprise Systems support work from NIH and many other government agencies. The NIH Computer Center serves as an application service provider, offering secure, stable, reliable servers for hosting customers' applications. System customers can access scientific and administrative data and applications, as well as develop new applications to meet the needs of an office, an agency, a lab, or a worldwide community of collaborators using the computing environment and platform most suitable for their applications.

In general, the NIH Computer Center operates on a fee-for-service basis; that is, charges to customers are based on the resources they use. The economies of scale possible in a complex

as large as the NIH Computer Center have resulted in computing costs declining or remaining unchanged for each of the last 25 years.

NIHnet, a wide area network supported by CIT, encompasses NIH facilities across the nation with connections to other agencies worldwide. It provides high-speed file transfer and interactive access from networked workstations. Expanding network services enable users to communicate with other systems locally and worldwide. Access to full-screen applications from personal computers and ASCII terminals is available through either network or dialup connections.

To assist users with the full extent of services, CIT provides consulting, training, and documentation. This manual is intended to provide users with a general description of what the system offers and how to use it effectively.

Other components of the Enterprise Systems include the following:

OS/390 South System

> The OS/390 South System is being merged with Titan. This multi-year effort will culminate with Titan providing all OS/390 services and facilities and the elimination of the South System.

Users of the OS/390 South System currently have access to batch processing, interactive systems (TSO, WYLBUR, DB2), Web facilities, statistical software packages, language compilers, database/transaction processing, client/server technology, terminal emulation and file transfer for desktop computer connectivity, automatic backups, online services, custom printing, and data security protection.

Operating system: the OS/390 Operating System using Job Control Language as the user interface and the Job Entry Subsystem Version 2 (JES2)

Interactive systems:

- ISPF
- TSO
- WYLBUR

Databases:

- IMS
- DB2

Language processors:

- COBOL/370
- VS FORTRAN
- PL/I
- Assembler Language
- REXX

Scientific Statistical Systems:

- SAS
- SPSS

SILK Web facilities:

- public and secure servers for general use
- online services

Connectivity products:

- QWS3270 PLUS
- NetTerm (TNVT)
- WS_FTP Pro
- MS-Kermit

Other:

- CONNECT:Direct for online financial transactions
- VPS printing system

Enterprise Open Systems (EOS)
The Enterprise Open Systems provide a stable application hosting and data-repository environment for database and information systems using Compaq/Digital AlphaServers and Sun servers. EOS is a Unix-based environment that hosts a variety of production and development applications at the NIH Computer Center. For more information, refer to the *Enterprise Open System User's Guide*, available from the CIT publication ordering service.

Operating systems:

- Tru64 UNIX
- Sun Solaris Operating System

Installed software (commercial):

- DEC COBOL

- DEC C
- DEC C++
- Netscape Enterprise Server
- Oracle Web Application Server

Database:

- Oracle

Windows Application Servers

Windows NT and Windows 2000-based applications can be hosted on CIT servers that are carefully managed and monitored on a 7x24 basis. This facility provides a computing environment suitable for critical enterprise-wide applications.

Major components of the Microsoft BackOffice Suite of applications are supported in an enterprise-wide environment, with services such as:

- Terminal Server
- SQL Server
- Exchange
- IIS

For additional information, go to:

http://www.nt.cit.nih.gov/

Other Enterprise Systems Services:

- Oracle server software for use on several platforms with concurrent Oracle usage rights
- site license agreements for distributing SAS for PC clients
- Central Email Service (CES) providing e-mail services for the NIH community
- NBARS, an OS/390-based service using TSM software providing backup and recovery for distributed data
- Disaster Recovery Program for disaster recovery facilities and services for "critical" applications that run on the OS/390 systems and the EOS system

1.1.2.2 Helix Systems

The NIH Helix Systems comprise several systems configured in a unified scientific environment. A front-end SGI Origin system (with the network name helix) is used for general purpose tasks, such as reading mail, transferring files, accessing the Web, and certain scientific applications. Additional systems offer special computation capabilities that enable compute-intensive scientific applications to run faster or more efficiently. An SGI Origin system (with the network name nimbus) augments helix by running specific scientific applications or user programs that require long execution times. The NIH Biowulf Cluster (with the network name biowulf) is a Beowulf parallel processing system designed and built by members of the Helix Systems staff, running the Redhat Linux operating system.

A 32-processor SGI Origin system (with the network name galaxy) and a 16-processr SGI Origin system (with the network name quasar) are designed for the development and execution of high performance parallel applications. These two Origin systems are jointly funded by the Division of Computer System Services (DCSS) and the Division of Computational Bioscience (DCB).

In addition to the standard Unix tools for software development, text formatting, and network communications, software packages for the Helix System include:

Scientific applications:

- GCG Sequence Analysis Package: an extensive package of programs for nucleic acid and protein sequence analysis
- Quest: interactive database search program for accessing the Cambridge Structural Database
- BLAST: basic local alignment search tool for nucleic acid and protein sequences.
- Lrna: performs suboptimal folding on linear RNA sequences
- CHARMm: models dynamic behavior and characteristics of molecular systems
- Gaussian: performs semiempirical and *ab initio* molecular orbital calculations
- Mathematica, MATLAB, S-PLUS: interactive systems for numerical analysis and graphics featuring, respectively, symbolic manipulation, matrix computation, and statistical analysis
- AVS and Interactive Data Language (IDL): interactive programs for analyzing and visualizing data
- Fastlink: fast-executing computationally intensive general pedigree programs from Linkage
- Fasta3: uses the Pearson-Lipman algorithm to compare a protein or nucleotide sequence against a sequence database (includes fasta, tfasta, tfastx, fastx, ssearch)
- ClustalW: general-purpose multiple alignment program for DNA or protein sequences
- Porpoise: alert service for new scientific literature that searches the weekly updates of the Science Citation Index Expanded and Social Sciences Citation Index databases
- WHALES: automatic alert service for new sequences in the major nucleotide and protein databases

Biological databases:

- GenBank: nucleic acid sequences
- PIR: protein sequences
- GCG: sequence databases for the GCG package
- PDB: protein structures
- Cambridge Structural Database: diffraction data from small organic and organometallic molecules

Programming languages:

- C, FORTRAN, and C++

Subroutine Libraries:

- IMSL: mathematical and statistical routines
- FIGARO: 2- and 3-d interactive graphics routines

Programming tools:

- static analyzer, debugger, performance analyzer tools

Network services:

- mail, pine, and Emacs rmail: email readers
- ftp: Internet file transfer utility
- Kermit:file transfer via modem
- X Window System: supports common X clients such as xterm, and S-PLUS, Mathematica, MATLAB and AVS applications
- Netscape, lynx: easy access to information from NIH information servers and information servers worldwide
- tin: newsgroup reader
- WebTermX: Web browser plug-in that lets Windows PCs run the X Window System
- eXodus: X Window System for Macintoshes

Editors:

- vi, edt, nedit, and GNU Emacs: full-screen editors
- ed and ex: line editors

The Technical Information Office provides documentation for users of the Helix Systems. Use the CIT publication ordering service to order these manuals.

For additional information about the Helix Systems, go to:

http://helix.nih.gov and http://biowulf.nih.gov

1.1.2.3 Advanced Laboratory Workstation (ALW) System

CIT provides network-based support for general purpose, open, distributed computing via the Advanced Laboratory Workstation (ALW) System Customer-owned Unix workstations connect to a world-wide distributed file system (AFS) via NIHnet, the NIH wide area network, to access shared resources and services such as file backup, software maintenance, security monitoring, scientific and office applications, online documentation, and the Internet. ALW administration is performed by the system, allowing the users to concentrate on their research.

ALW System workstations are particularly suitable for scientific applications requiring high performance desktop computing or graphics, or access to large amounts of data. These workstations are manufactured by a variety of vendors.

The most popular applications include medical image processing, DNA and protein sequencing and searching, statistical analysis, and molecular graphics and modeling. Applications offered include:

- genomic sequence analysis packages
- image processing
- mathematics packages
- molecular modeling
- statistical packages
- office automation applications
- other software

Additional information about the ALW System is available on the Web at:

http://www.alw.nih.gov

1.1.3 Division of Computational Bioscience (DCB)

The Division of Computational Bioscience is a research and development organization that provides scientific and technical expertise in computational science and engineering to support biomedical research activities at the NIH. DCB applies the concepts and technologies of computer, engineering, physical, and mathematical science to biomedical applications including the areas of image processing, bioinformatics, genetic databases, structural biology, scientific visualization, medical imaging, telemedicine, signal processing, biomedical instrumentation, and biomathematics. DCB develops computational methods and tools for solving biomedical laboratory and clinical research problems. DCB promotes the application

of high-performance computing to biomedical research and provides high-performance computing resources for the NIH scientific staff.

1.1.4 Division of Enterprise and Custom Applications (DECA)

Application or software development is a risky, often complex, and difficult undertaking. Success in developing useful software requires a staff with multiple advanced skills and experience. DECA's highly trained staff includes certified project managers, with years of NIH experience, who understand the specialized requirements of the NIH environment and are able to translate NIH's tried and true best practices into products that work.

DECA takes a leadership role in the development, support, and maintenance of enterprise systems at NIH. (Enterprise systems are those IT systems that are broadly based, either in size or influence, and that are expected to be used widely throughout an agency.) NIH has three such system areas: administrative systems, grants management systems, and clinical information systems. CIT, through DECA, partners with the managers of each of these systems.

1.1.5 Division of Network Systems and Telecommunications (DNST)

The Division of Network Systems and Telecommunications directs the engineering, design, implementation, and support of network infrastructure and services for the NIH wide area network (NIHnet) to facilitate the use of scientific, administrative, and other business applications. The Division manages and directs NIH telecommunications systems and develops technical requirements for the NIH ICs and implements telecommunications programs to meet the needs of the NIH community.

DNST researches, develops, and tests next-generation networking/ telecommunications technologies and develops and supports applications using new network technologies, such as telemedicine and video conferencing. It provides consulting, guidance and support to the ICs, helping them to meet their network requirements. To improve the information infrastructure on networking/telecommunications activities, DNST serves as liaison to the NIH ICs and other DHHS components.

DNST serves as the focal point for telecommunications service orders, and develops and disseminates recommended standards, policies, and procedures for the nationwide implementation and management of NIH networking and telecommunications systems. DNST also develops, implements, and supports remote access services to NIHnet, provides technical support for wireless services, and a 24-hour telephone/network support service.

1.1.6 Division of Customer Support (DCS)

The Division of Customer Support provides centralized, integrated computer support services to the NIH computing community. DCS advocates customer needs to CIT management and represents services and policies to CIT's customers. It plays an active and participatory role in supporting desktop computing to the end user in the areas of software and hardware,

including Internet, telecommunications, and access technologies. DCS also coordinates and oversees CIT's Training Program for the benefit of the NIH computing community. In addition to providing a central account establishment and management services for access to CIT systems, DCS also manages an NIH-wide help desk and implements service request systems.

The Division of Customer Support is responsible for providing statistical and mathematical software (available on several platforms) training on the use of the software, statistical advice, and interpretation of output. This service is readily available for the support of all computer users employed by the ICs (Institutes and Centers) of the NIH community, as well as those employed by other government agencies and/or representatives of organizations that are under contract to perform government work. The program library includes the following software packages that run on Titan:

SAS (see Section 7.6.1)
SPSS (See Section 7.6.2)
BMDP
IMSL
SUDAAN
MSTAT1

1.2 MAPS AND DIRECTIONS

The NIH Computer Center and its associated offices are in buildings 12, 12A, and 12B on the NIH campus at 9000 Rockville Pike, Bethesda, Maryland 20892. The map below is an abstract illustration of the NIH Campus showing the general locations of the buildings, parking areas, and main roads. Parking is extremely limited; visitors are encouraged to use public transportation.

Figure 1-1. Map of the NIH Campus

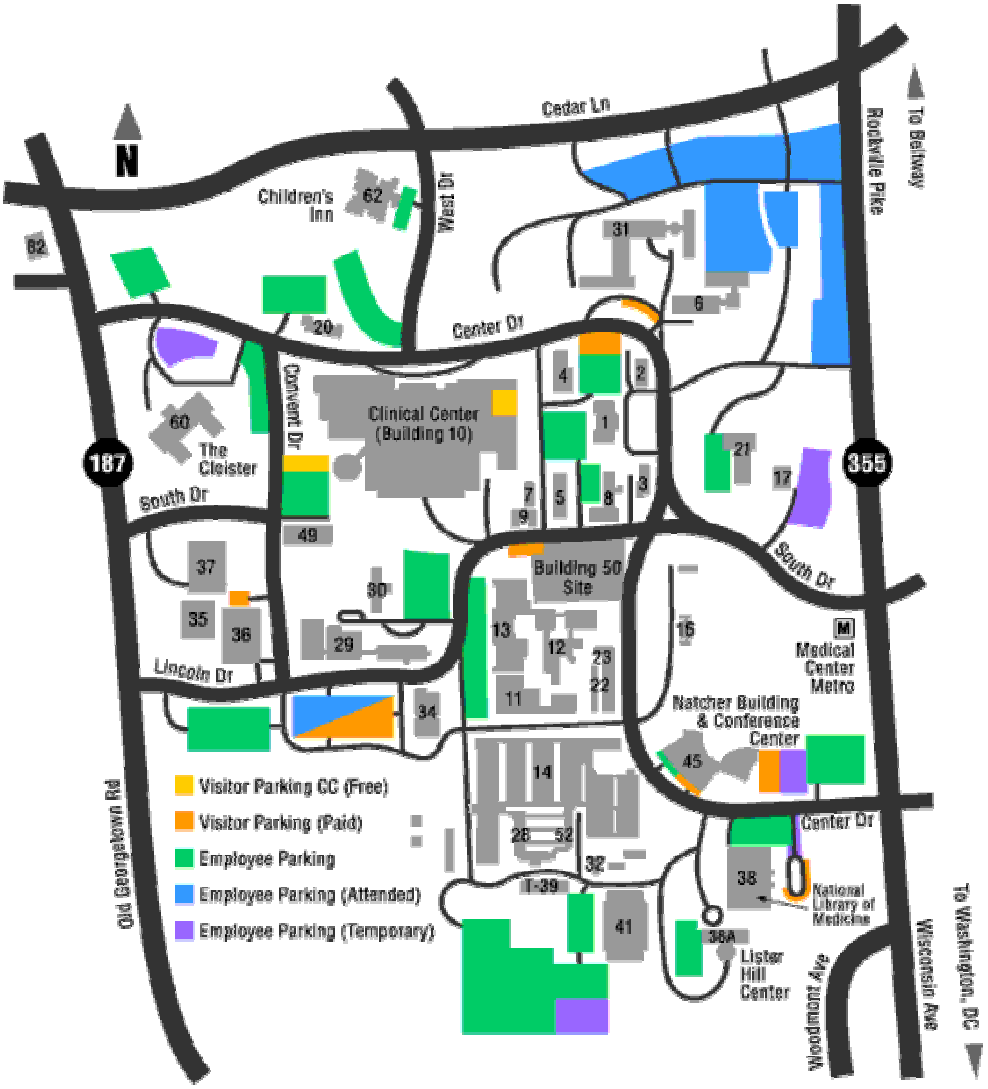


Figure 1-2. Map of Washington Area

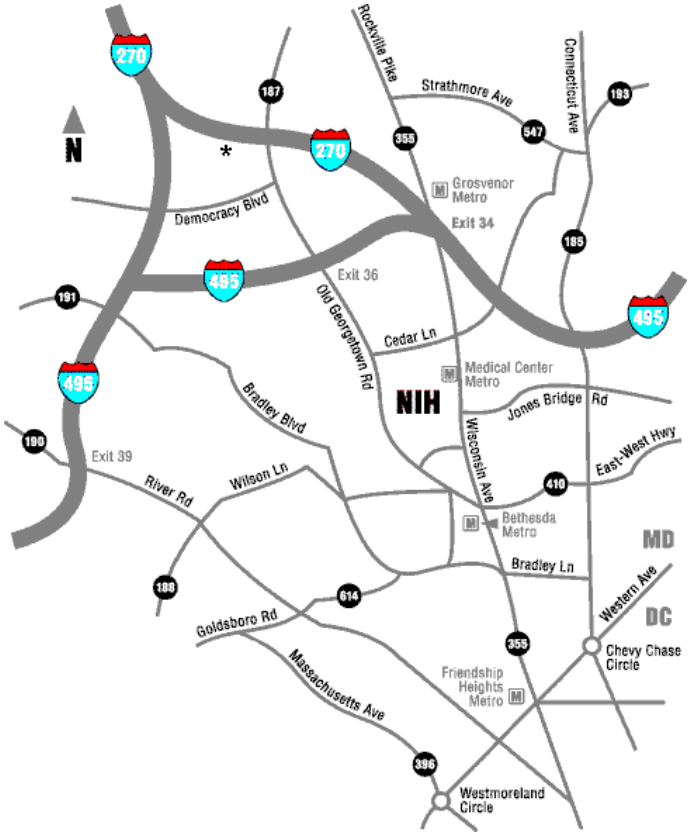
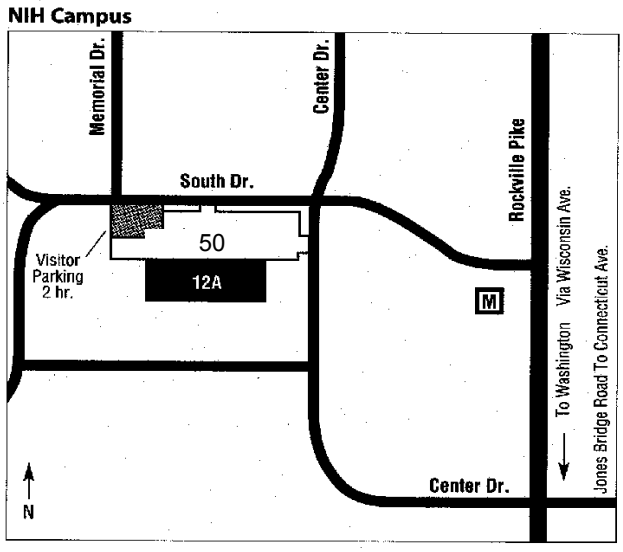


Figure 1-3. Map of CIT



Directions to the NIH Computer Center

By subway:
- Take the Metrorail Red Line to Medical Center stop.
- Continue walking forward down south Drive after getting off the escalator.
- Cross the intersection of Center Drive (stop sign). The NIH Computer Center (building 12A) is on the left.

See map for Metrorail.

By car:
Interstate 495 Westbound
- Take exit 33B Connecticut Avenue (Chevy Chase).
- Turn left onto Connecticut Avenue.
- At first traffic light, Jones Bridge Road, turn right.
- Cross Rockville Pike and drive .4 of a mile on Center Drive. The NIH Computer Center (building 12A) is on the left.

Interstate 495 Eastbound
- Take exit 34B Wisconsin Avenue/Bethesda.
- Drive approximately two miles south on Rockville Pike.
- At the fourth traffic light, South Drive, turn right.
- At the stop sign, Center Drive, turn left. The NIH Computer Center (building 12A) is on the right.

Interstate 270 (from Gaithersburg)
- Take I-270 to Rte. 495 Washington (East).
- Exit Rte. 495 at Rte. 355 (Wisconsin Avenue).
- Drive approximately two miles south on Rockville Pike.
- At the fourth traffic light, South Drive, turn right.
- At the stop sign, Center Drive, turn left. The NIH Computer Center is on the right.

Wisconsin Avenue (from D.C.)
- Proceed north from the District to 8600 Rockville Pike (1st traffic light, Center Drive, at north end of Bethesda Business District, after the Ramada Inn).
- Turn left and go approximately .4 of a mile. The NIH Computer Center (building 12A) is on left.

NIH visitor parking is extremely limited. The use of carpools and public transportation is encouraged. The NIH Police strictly enforce all parking regulations.

To get to CIT by bus:
- Metrobuses and Montgomery County RideOn buses make stops at the Medical Center Metro stop. Some Metrobuses make regular stops at several NIH locations.
- Call Metro information for time schedules and routes (202) 637-7000.

1.3 TELEPHONE NUMBERS

This section contains a telephone directory to key services. Users without a network connection can access the OS/390 systems and the Silicon Graphics (helix) component of the Helix Systems via FTS2001 using a dialup connection. See Section 6.1. Persons calling 402, 435, 443, 451, 480, 496, 594, or 827 exchange telephone numbers from other 402, 435, 443, 451, 480, 496, 594, or 827 numbers should use only the last five digits of the phone numbers.

The area code for the NIH Computer Center is 301. For long distance users whose data phones are not on the FTS2001 system, the interactive services are available through 800 numbers.

See Section 6 for the specific phone numbers for dialup access to the mainframe facilities.

1.3.1 Computer Services

Note: The Area Code is 301. All Telephone numbers are accessible through FTS.

Figure 1-4. Computer Services

SERVICE	OFFICE	BLDG./RM	TELEPHONE
ENTERPRISE SYSTEMS (OS/390, Unix, and Windows servers)			
Database Support	Database Systems Branch	12/2200	496-9158
IMS Support	Database Systems Branch	12/2200	496-6244
Help Desk	TASC	12A/1011	594-6248
New Applications	Application Services Branch	12A/4011	496-5524
Operating Schedule - OS/390 (recording)	--	--	402-2211
Security Investigations and Assistance	TASC	12A/1011	594-6248
Fax Number	--	--	496-6905
Security Policy	CIT Security Coordinator	12A/4033	496-1053
Tape Library	Systems Operations Mgmt. Branch	12/1100	496-6021
SCIENTIFIC SYSTEMS (Helix and Advanced Laboratory Workstation)			
Help Desk - ALW**	TASC	12A/1011	594-6248
Help Desk - Helix	TASC	12A/1011	594-6248
Operating Schedule – Helix, EOS (recording)	--	--	402-2212
Operator - Helix	--	12/2200	496-6755
CONNECTIVITY SERVICES (E-mail, Networks, File Transfer, Access to Enterprise and Scientific Systems)			
Help Desk	TASC	12A/1011	594-6248
GENERAL SERVICES			
Accounts/Billing, Registration	TASC	12A/1011	594-6248
ADB Support**	TASC	12A/1011	594-6248
Application Programming**	Division of Enterprise and Custom Applications	Federal Bldg.	594-6248
Computer Center General Policy	Director, Division of Computer System Services	12A/4039	496-5381
Computer Center Security Policy	CIT Security Coordinator	12A/4033	496-1053
Disaster Recovery Process	Disaster Recovery Coordinator	12A/4033	496-1053
Documentation/Publications	Technical Information Office	12A/1011	594-6248
Output Distribution and Foreign Tape Handling			
NIH Campus	Output Distribution	12A/1000	496-6183
Parklawn Building	Output Distribution	2B70	443-4253
Public Information on CIT	Information Office, CIT	12A/4063	496-6203
Foreign Tape Handling	Output Distribution	12A/1000	496-6183
Statistical Packages	TASC	12A/1011	496-6248
TDD Line for Hearing Impaired	TASC	12A/1011	496-8294
Telecommunications Problems	TASC	12A/1011	594-6248
Training	TASC	12A/1011	594-6248

*Non-NIH number; requires "9" prefix. **Services available to NIH employees only.

World Wide Web access to CIT through http://cit.nih.gov

1.3.2 Online Telephone and E-Mail Directories

There are several online directories available.

NIH Directory and E-mail Forwarding Service

The NIH Directory and E-mail Forwarding Service can be accessed from any Internet-connected computer. NIH staff can use the Web-based change form to keep entries up-to-date. You can access this directory through the World Wide Web at:

http://directory.nih.gov

DHHS Phone Directory

The Department of Health and Human Services telephone directory is available on the Web. You can search the directory by employee name or look for information for a particular office. Employees can correct their directory information using an online form. Go to:

http://directory.psc.gov/

1.4 OPERATING HOURS

Although the OS/390 component of the NIH Computer Center operates on a seven-day 24-hour basis, the availability of individual services varies. The operating hours for all the Enterprise Systems (OS/390 Titan, OS/390 South, Enterprise Open Systems, and Windows application servers) can be found on the World Wide Web at:

http://silk.nih.gov/public/public.schedule

Figure 1-5. Operating Hours

System Service and Day	Hours
Titan Service	**Hours**
TSO, WYLBUR, CICS ADABAS, Model 204, Batch	24 hours, 7 days a week*
OS/390 South	
Batch Processing Monday-Saturday Sunday	 24 hours 2:00 a.m. - midnight
Output Distribution Services Monday-Friday Weekends	 24 hours As workload dictates
WYLBUR, TSO, and Remote Batch Service Monday-Saturday Sunday	 24 hours 2:00 a.m. - midnight
DB2 Batch Service Monday-Saturday Sunday	 24 hours 3:00 a.m. - midnight
DB2 Interactive Service Monday-Saturday Sunday	 24 hours 3:00 a.m. - midnight
IMS (restricted availability) Monday-Friday	 8:30 a.m. - 6:00 p.m.
Other CIT Services	
Technical Information Office Monday-Friday	 8:00 a.m. - 5:00 p.m.
TASC - Consulting Desk Monday-Friday Office hours Telephone hours	 8:00 a.m. - 5:00 p.m. 7:00 a.m. - 6:00 p.m.
CIT Training Program Monday-Friday	 8:30 a.m. - 4:30 p.m.
Information Media Library Monday-Friday	 7:30 a.m. - 5:00 p.m.
Other Offices Monday-Friday	 8:30 a.m. - 5:00 p.m.

*Unattended service Thanksgiving, Christmas and New Year's Day.

Call the Operating Schedule number, listed in Section1.3.1, anytime after Thursday morning to get information on the status of service to be provided during the weekend and upcoming holidays. Special arrangements for service beyond the announced schedule may be possible if needed; contact the head of Computer Operations through CIT's TASC (Technical Assistance and Support Center).

Unattended Service on Titan
Unattended service allows the use of some portions of the OS/390 services during periods of time (such as holidays) when these services would otherwise be unavailable. Go to:

http://silk.nih.gov/public/public.schedule

for information about specific holidays when unattended service will be in effect and the limitations on unattended service.

Unattended service currently consists of ACS WYLBUR, TSO, ADABAS, and Model 204 availability. Users are able to do most of their regular WYLBUR-based, TSO-based, ADABAS-based, and Model 204-based tasks during the unattended service period. All batch processing services that do not require foreign tape access are available. During unattended service:

- No jobs are printed locally.
- No foreign tapes are mounted (NIH tapes can be mounted).
- Some migrated data sets and data set backups are not accessible (e.g., some NBARS data sets).
- Normal OUTPUT HOLD time limits are enforced.

1.5 PROPER USE OF THE NIH COMPUTER CENTER

All users of the CIT Enterprise Systems are expected to abide by all laws and regulations regarding the proper use of government information technology resources. Users are expected to comply with the following when using the CIT systems:

- The Enterprise Systems are to be used for official government business only. Users must not use the systems for personal gain, outside business activities, political activity, fund raising, charitable activity not sponsored by a government agency, or for playing games (even in learning situations).
- Users must not use CIT systems to produce, store, display, or transmit material that is offensive to others including sexually explicit or suggestive materials.
- Users must not use the CIT systems to produce, store, display or transmit material that constitutes harassment of other individuals on any basis including race, ethnicity, or sexual orientation.
- Users must not use the CIT systems as a staging area for gaining unauthorized access to any other information systems or for, in any way, damaging, altering, or disrupting the operations of the other systems.
- Users must not use the CIT systems and services for capturing or otherwise obtaining passwords, encryption keys, or any other access control mechanism that could permit unauthorized access to any computer system.

- Access to information on the CIT systems is the sole responsibility of the "owner"—the account sponsor or registered user—of the information. Users must not access that information without the explicit permission of the owner, regardless of the degree of access control applied. The only exception is users may freely access information that is stored under a facility for general availability such as the World Wide Web or public libraries.
- Users are expected to use the services and facilities provided by the CIT systems in accordance with the standards set forth in the appropriate guides. If a facility is not described in any guide, contact TASC for assistance before attempting to use it.
- Users must not use electronic communications such as electronic mail to harass others, send obscene messages, forward chain letters or hoaxes, or send mass mailings indiscriminately.

Users who violate these rules of behavior are subject to disciplinary action in accordance with the NIH Information Technology General Rules of Behavior.

Authorities:

- Public Law 93-579, U.S. Code 532(a), the Privacy Act (1974)
- Public Law 99-474, 18 U.S. Code 1030, the Computer Fraud and Abuse Act (1986)
- Standards of Ethical Conduct for Employees of the Executive Branch, 5 C.F.R. Part 2635
- HHS Standards of Conduct, 45 C.F.R. Part 73, Subpart M
- NIH Information Technology General Rules of Behavior at:

  http://irm.cit.nih.gov/security/nihitrob.html

Software distributed by the NIH Computer Center, CIT, is obtained under a variety of legally binding license agreements that restrict the use, duplication, and transfer of the software and associated documentation. Unauthorized use, duplication, and/or distribution of this software can result in penalties for both the individual responsible and the National Institutes of Health, including civil damages up to $50,000 for each occurrence and criminal penalties including fines and imprisonment.

Each software package and associated documentation distributed by the Computer Center is authorized for limited use in conjunction with the services provided by the NIH Computer Center. This software and documentation may not be duplicated or transferred to any other individual or facility. Each user who requests and receives software distributed by the NIH Computer Center is responsible for insuring its proper use. In the event of improper use, unauthorized copying or redistribution of the software and/or associated documentation, the NIH Computer Center will contact the responsible user and account sponsor for corrective action. If questions arise about software distributed by the NIH Computer Center, please contact the TASC consulting desk.

1.6 CONTRACTING GUIDELINES

When an organization is preparing or administering a contract for software to be used at the NIH Computer Center, particular attention should be paid to the following sections of the *Titan User's Guide*:

1	ORIENTATION
2	REGISTRATION AND DEREGISTRATION
4	SECURITY AND DISASTER RECOVERY
5.1	SOFTWARE SUPPORT
5.2.5	Assistance for Implementing Non-NIH Software
7.1.1.2	Software Features Not Permitted at NIH
9	BATCH JOB SERVICES

In addition, the contracting office and account sponsor should be familiar with the *Titan User's Guide*.

The *Titan User's Guide* defines the Computer Center's current software standards; however, these change with the passage of time, in response to the needs of our users and developments in computer technology. Because of this, it is a good idea to discuss the proposed software with the Application Services Branch (ASB) before the contract is finalized. ASB will be able to provide some guidance concerning hardware and software changes which may occur in the relatively near future. ASB is also familiar with many

alternatives that may be used in place of standard IBM facilities and other software whose use is not permitted at NIH.

1.7 ACCESS FOR PERSONS WITH DISABILITIES

It is important that all of our users have full access to Computer Center services and facilities. The Americans with Disabilities Act of 1992 was passed to ensure that persons with disabilities have equal opportunities and guarantees of civil rights. "Reasonable" accommodation, access to facilities and alternate forms of media and communication are inherent in the implementation of the Act. CIT is in compliance with Section 508 of the Rehabilitation Act, amended in 1998, concerning the accessibility of electronic and information technology (including Web pages) for persons with disabilities. For information about Section 508, go to:

http://508.nih.gov

The NIH Computer Center and the associated offices of CIT, such as the Technical Assistance and Support Center (TASC) and the CIT Computer Training Program, are located in a wheelchair-accessible building. Individuals who are hearing or speech-impaired can contact any person or office within the Center for Information Technology via a TDD (Telecommunications Device for the Deaf) located in the office of the Computer Training Program. The TDD is answered during the office's regular hours. See Section 1.4.

All users, including individuals with disabilities, are welcome to attend any course in the CIT Computer Training Program for which they meet the technical and administrative prerequisites. There is elevator service to the classroom level; both the classrooms and the restrooms, on the same floor, are wheelchair accessible. If any special services, such as a sign language interpreter, recorded notes, or specialized terminal will be needed, the prospective student should contact the CIT Computer Training Program staff at least two weeks prior to the beginning of the class to make the necessary arrangements. Because elevators cannot be used in case of fire, students who may need assistance negotiating the stairs should inform the CIT Computer Training Program staff well before the first day of the class.

Users with special needs who would like to make suggestions concerning the accessibility of the NIH Computer Center and its related CIT services should contact TASC or submit an OS/390 Service Request Ticket (see Section 5.2.2).

For more information on IT accessibility resources and other accessibility resources, go to:

http://irm.cit.nih.gov/policy/access.html

2 REGISTRATION AND DEREGISTRATION

This section describes the procedures for registration for the services of the OS/390 Titan system of the NIH Computer Center and the deregistration process. Questions concerning registration should be directed to the CIT Technical Assistance and Support Center (TASC). See Section 1.3.1 for the phone number.

2.1 ACCOUNT OFFICIALS

When an organization uses Titan services, responsibilities relating to registration, deregistration, billing, and security use are assigned to persons within the customer organization. CIT refers to these account officials as:

- account sponsors (see Section 2.2.1)
- deregistration officials (see Section 2.4.1)
- billing coordinators (see Section 3.2.1)
- security coordinators (see Section 4.6)

All Titan account officials must be government employees. They should all be familiar with the Web facility for displaying and maintaining account and customer information. (See Section 2.3.) For each Titan account official role, there is one primary and any number of alternates. A person within an organization can hold several positions. For example, the account sponsor can also be the security coordinator, the billing coordinator and the deregistration official.

The Administrative Officer or Executive Officer of an organization can name a deregistration official for an account. The deregistration official, in turn, can change the primary account sponsor and alternate deregistration officials. In addition to the deregistration official, the primary account sponsor can assign and remove alternate account sponsors, and reassign the primary account sponsor. Any account sponsor can assign, reassign or remove security coordinators and billing coordinators.

Figure 2-1. Account Official Assignments

Official	Assignments
Administrative Officer or Executive Officer	Names deregistration official for an account
Deregistration official	Assigns/reassigns • primary account sponsor • alternate deregistration officials
Primary account sponsor only	Assigns and removes alternate sponsors Reassigns primary sponsor
Any account sponsor	Assigns/reassigns, removes • security coordinators • billing coordinators

2.2 REGISTRATION FOR SERVICES

> Please use the former North System registration facility or contact TASC concerning Titan registration until Titan Web Sponsor becomes fully operational.

This section describes the procedures for user registration for the services of the OS/390 Titan system of the NIH Computer Center. Users who were registered to use the previous CIT OS/390 North system are automatically registered to use Titan.

New users must be registered with CIT before using Titan services at the NIH Computer Center. Registration certifies that the user has an operating program requirement and funds with which to reimburse the NIH Computer Center for services received.

To initiate an account, a person with authority to obligate funds must complete an Account Authorization form for the organization and an Interagency Agreement, if the sponsoring organization is outside of NIH. For registration information and downloadable forms, go to:

http://support.cit.nih.gov/accounts

The forms must be faxed or sent to CIT. After receiving the appropriate forms, CIT will establish an account code for the user organization. Account codes are unique codes used to identify the recipient of services. Additional users for an organization can be registered through Titan Web Sponsor, available at:

http://websponsor.cit.nih.gov

Users who wish to register for services should contact an account sponsor within the organization. The account sponsor authorizes the use resources and services at CIT and can add users to the account.

After completing the registration process, a unique USERid and a temporary password are given to the account sponsor who, in turn, will inform the new user. The original access password that is assigned must be changed immediately upon receipt to ensure further security.

Account sponsors must maintain close surveillance of user registration data for their organizations. Current information (e.g., telephone number, address) on each user must be available to fulfill security requirements and to permit CIT to contact users directly. Account sponsors monitor the account through Titan Web Sponsor. For more information on Titan Web Sponsor, see Section 2.3. For additional information, call TASC or send e-mail to TASC@cit.nih.gov.

2.2.1 Responsibilities of Account Sponsors

Each user organization must appoint an account sponsor as the primary point of contact between the user and the NIH Computer Center. To learn the name of the account sponsor for an agency, contact TASC.

Account sponsors and their designated alternates play a vital role in the success of the computer applications that are run at the NIH Computer Center. Because of this, each sponsor should designate at least one alternate to accept responsibility in the sponsor's absence. Sponsors and alternates must be government employees. They have full responsibility for their computer accounts. Account sponsors must ensure that all computer applications directly relate to the official government business defined in the request for use of the NIH Computer Center, and that all work adheres to the Center's published standards and procedures.

Account sponsors use Titan Web Sponsor to perform account and USERid changes interactively. For more information on Titan Web Sponsor, see Section 2.3.

The account sponsor and the alternate should have some understanding of NIH Computer Center operations. Sponsors are urged to take advantage of the wide variety of services described in this manual. There are extensive self-study and classroom training opportunities offered by the CIT Computer Training Program (described in Section 5.3). CIT provides documentation via the CIT publication ordering service (see Section 5.4).

CIT wants to know of any problems encountered by account sponsors and would like to hear about their concerns. Submit an OS/390 Service Request Ticket to communicate user problems, and to apply for refunds. See Section 5.2.2 for further information. Occasionally CIT will have to contact an account sponsor in order to update information or if a problem arises concerning the use of an account.

The CIT Technical Assistance and Support Center (TASC) serves as the central point of contact for all CIT accounts and welcomes inquiries from sponsors concerning administrative procedures. Go to Titan Web Sponsor to view many of the specific responsibilities of account sponsors.

2.2.2 Accounts

Accounts identify the customer organizational unit responsible for reimbursement of the charges to be incurred. Accounts will not change from those used on the previous CIT OS/390 North and South Systems. All former agency codes/accounts will exist on Titan. All accounts on Titan are defined as RACF groups and the USERids and RACFids assigned to an account are members of that RACF group.

2.2.3 USERids

USERids are required for accessing system services such as batch jobs, interactive and database systems, and RACF. A USERid identifies a particular registered user of a system. All users should have their own USERid and RACFid. USERids and RACFids **should not be shared**. On Titan, the USERid:

- validates individuals signing on to the system (also known as TSOid)
- is the high-level qualifier for user-owned data sets
- identifies users who are permitted access to data (also known as RACFid)

If a user causes systems problems and cannot be located by CIT staff, the USERid will be deactivated until contact is made.

The Titan USERid scheme accommodates the former OS/390 USERids with no need to rename disk data sets.

Characteristics of Titan USERids

- Titan USERids may be from 3 to 8[1] characters long, with the first character an alphabetic letter or a $. **Note:** Any user application that captures the RACFid must be able to accept a RACFid that is from 2 to 8 characters in length.
- Each USERid is associated with one and only one account.
- The USERid, TSOid[2] and RACFid are identical.

[1] Full implementation of the USERid format for customer ids will not take place until the South System transition begins.

[2] TSOids are limited to 3 to 7 characters in length. USERids of 8 characters cannot have an associated TSOid.

- User-owned data sets must begin with either the USERid—with the form *userid*.name (e.g., johndoe.dataname)—or with the account (e.g., *aaaa*.dataname or *aaa*.dataname). For information on data set naming conventions, see Section 10.

Figure 2-2. Format for Titan Identifications

Titan Identification	Format[3]
USERid	From 3 to 8 alphanumeric characters ($iii for former North system users or aaaaiii for former South system users)
account	Three or four alphanumeric characters (e.g., aaa or aaaa)
RACFid	Same as USERid
TSOid	Same as USERid
RACF group	Same as account
Dsname	*userid*.dataname or *account*.dataname

2.2.4 Account Authorization Forms

The CIT user registration system will undergo changes to accommodate the transition to Titan. In the meantime, please use the current CIT registration forms available from the Web.

http://support.cit.nih.gov/accounts

2.2.4.1 CIT Titan New Account Code Request

Anyone within NIH who wishes to open a CIT account that includes Titan access must fax or mail this form to TASC. Although the requester can be anyone who can be contacted if there are questions about the form, the authorizing official who signs the form must have the appropriate authority within the Institute or Center (IC), or government agency. To authorize additional users on an account, sponsors must use Titan Web Sponsor.

2.2.4.2 CIT Titan Interagency Agreement

Government organizations outside the National Institutes of Health may obtain CIT services, including access to Titan, through an interagency agreement. Requests should be directed to TASC. Organizations should fax or mail this form to CIT.

[3] While the migration progresses, all USERids will be restricted to the North and South formats. When both North and South Systems have migrated, there will be additional options for USERids.

2.3 TITAN WEB SPONSOR

> Please use the former North System registration facility or contact TASC concerning Titan registration until Titan Web Sponsor becomes fully operational.

Account sponsors, security coordinators, billing coordinators, and deregistration officials can use a Web-based facility—Titan Web Sponsor—to display information and perform many account and security-related functions for the accounts and USERids under their control. Titan Web Sponsor includes functions such as:

- downloading account forms
- registering users
- resetting passwords for users on the account
- revoking, restoring, or reassigning USERids
- updating addresses, output box numbers, and telephone numbers for users on their accounts closing accounts
- registering and removing registration for Model 204
- reassigning USERids
- closing accounts
- displaying an account log and a customer log. Web Sponsor displays the number of datasets, number of tapes, and the Model 204 ID (if there is one) for each USERid valid for the account, or for the specified USERid.
- changing/assigning primary and alternate account officials

Most actions through Web Sponsor are effective immediately. Once the change has been processed, confirmation is sent to the requester by electronic mail.

To use Titan Web Sponsor, go to:

http://websponsor.cit.nih.gov

RACF security protects all Titan system databases from unauthorized access. The first time that the Web Sponsor page is accessed from a Web browser, a security "pop-up" window prompts for a USERid and password. Only account sponsors with valid USERids and passwords will be allowed to display and change data for their account.

2.4 DEREGISTRATION FROM SERVICES

Deregistration officials are responsible for ensuring that users who are no longer authorized to incur costs have their access/authorities removed from NIH systems.

2.4.1 Responsibilities of Deregistration Officials

Deregistration officials are appointed by the NIH IC (Institute, Center) Executive Officer or the responsible agency official. The deregistration official has ultimate responsibility for ensuring that access to CIT computing services, including financial systems (e.g., databases on the OS/390 System), is denied when an employee resigns or is transferred to another IC or government agency. Since deregistration officials are responsible for some issues regarding funds, security, and privacy with respect to the NIH Computer Center, they must always be government employees. Primary deregistration officials should designate an alternate in case they are not available.

The deregistration official carries out the following responsibilities:

- oversees the deregistration of users from their account(s)
- resets RACF passwords when users leave the IC or agency
- **Primary deregistration official only:**
  - assigns or removes alternate deregistration officials
  - reassigns primary deregistration official
  - adds, changes, or removes account sponsors, including selecting a new primary account sponsor

Deregistration officials use Titan Web Sponsor to carry out many of their functions. See Section 2.3.

2.4.2 Terminating Use of Services

Account sponsors use Titan Web Sponsor to help close an account or to remove a user from an account. Closing an account or removing a user from an account can only take place after all of the requirements listed below have been met.

- The account sponsor ensures that all computing resource usage has ceased prior to terminating use of services.
- The USERid no longer owns data sets or tapes.
- Data sets and tapes that contain important or useful data have been transferred to another USERid.
- All unneeded data sets have been scratched and unneeded tapes released.

The specific steps required to perform this reassignment/release of data and resources are listed below. Many of these steps can be accomplished through Titan Web Sponsor, as indicated.

- Rename all data sets that are still of active use to the organization. Reassign them to valid USERids and accounts (Titan Web Sponsor).
- Cancel subscriptions to Internet listserv lists.
- If the person leaving has acted as the contact point for dedicated hardware, the name of the new contact must be sent to TASC.
- Remove the USERid when the cleanup is complete (Titan Web Sponsor).

  An alternative to canceling USERids as described above is to reassign the USERids to another user in the office. In this way, the USERid is placed under the control of another employee without having to reassign or release any data sets and tapes. When using this approach, the account sponsor should ensure that the resources used by the reassigned USERids are closely monitored. Contact the CIT Technical Assistance and Support Center (TASC) if there are any questions concerning the reassignment of USERids or the deregistration procedure.
- If an account is to be closed, first remove each USERid in the account. Then, use Titan Web Sponsor to close the account once the cleanup is complete.

3 CHARGING

The schedule of rates for the various services offered by Titan is available in Section 3.1. For billing purposes, every request for service identifies the user by the Titan USERid described in Section 2.2.3. This code must be used on all requests for services as well as on every JOB statement.

Leased services (i.e., leased communication lines) must be allocated by CIT. The account sponsor must submit a written request to CIT in order to allocate or discontinue the use of these services. CIT charges user organizations on a pro rata basis for the leased services during the time of allocation.

3.1 CHARGING FOR INDIVIDUAL SERVICES

The rates (i.e., charges) for CPU time are based on a previous, slower processor model (9672 Generation 3). Since the current Generation 5 processors are twice as fast at the older ones (i.e., provide twice as much processing per second), you should multiply the processing time shown on job output by two before applying the CPU time rate. The Titan system billing rates are as follows:

Figure 3-1 Titan Charges

Service	Rate
Batch CPU (per 9672G3 second)	$.90 *
Batch I/O (SIO) (per 1,000)	$.15
Interactive CPU (per 9672G3 second)	$1.04 *
Interactive I/O (SIO) (per 1,000)	$.15
Disk storage (per MB-day	$.045 **
Tape mount	$.50
Tape storage (per tape-day)	$.03
Printing (per page)	$.06
Printing (labels/1,000 lines)	$1.15
Microfiche Original Duplicate Minimum per job	 $2.00 $ .25 $2.50
RJE Setup fee for new RJE Dedicated line (per month)	 $100 CIT cost pass thru
Model 204 and ADABAS	charged by CPU usage and I/O at either the interactive or batch rate, as appropriate.

* A shift discount of 50% applies to both batch and interactive processing. Prime shift is 7:00 a.m. to 5:00 p.m., Monday through Friday. Discount period is all other times.

** **Disk storage rates will be significantly reduced in FY 2002 as part of the transition to Titan**.

3.1.1 Discount Processing

Discount service offers a 50% discount to interactive and batch processing between the hours of 5:00 p.m. and 7:00 a.m. Monday through Friday and all day on weekends. Federal holidays are treated the same as weekdays. There is no discount for tape mounting. To request batch processing during the discount period, add the following control statement:

```
/*DISCOUNT
```

after the JOB statement. Even if a job does not include a `/*DISCOUNT` statement, any job that begins execution during the discount period will receive the discount rate.

For more information on job control language, see the manual *Batch Processing and Utilities at the NIH Computer Center*.

3.2 BILLING

Titan uses the CIMS billing system to prepare invoices. CIMS enables budget and administrative officers to track CIT charges. Titan billing coordinators can view their invoices on the Web. Contact TASC for details. The invoice shows charges for the previous month as well as the total charges for the fiscal year for OS/390-based services and other miscellaneous services.

3.2.1 Billing Coordinators

Each organization using the Titan system must have a billing coordinator, (usually a financial officer) assigned by the account sponsor. The billing coordinator has financial responsibility for the accounts. The billing coordinator signs the CIT Titan Interagency Agreement and receives the bills from CIT.

There must be one primary billing coordinator and any number of alternates. The billing coordinator:

- receives invoices (primary billing coordinator only) for appropriate accounts
- accesses billing data

3.2.2 Refund Policy

If you think that you have been overcharged for Titan services, you can apply for a refund and CIT will investigate your charges. Refunds are given for jobs that fail for the following reasons:

- hardware failure
- failure due to NIH Computer Center-supported software

- operational errors

There are no refunds for:

- Jobs aborting due to user's application program failure
- I/O errors caused by defective foreign tapes
- Errors occurring or jobs aborting as a result of the user violating instructions or restrictions as stated in the *Titan User's Guide* and *Batch Processing* and *Utilities at the NIH Computer Center*. This also includes errors occurring or jobs aborting as a result of exceeding job limits or failing to follow vendor reference manuals and warnings.

Obtaining Refunds
To request a refund for a run that has aborted due to an error/problem with NIH Computer Center services, the user should contact TASC by phone or submit an OS/390 Service Request Ticket (SRT) (see Section 5.2.2). The user will be required to submit all supporting documentation (i.e., source listing, dumps, and terminal listings) to TASC. All evidence necessary for investigation of the problem should be preserved unchanged.

CIT will review the request and contact the user (by telephone or e-mail) to report whether the request for a refund has been approved or denied. If a refund is not justified, the staff member will provide the user with an explanation.

If a refund is approved, the appropriate amount will be credited to the user's account and will appear as a credit on their monthly statement. Because of the processing overhead, refunds for services amounting to less than $10.00 will not be credited, however you can accumulate batch charges until they total $10.00 or more.

3.3 CONTROLLING COSTS

CIT wishes to help users make efficient and effective use of its facilities. This section includes suggestions to control their information processing costs. See Section 3.2 for information on billing.

Batch Processing
In addition to the hints below, the documentation for individual programming languages and procedures often contains additional cost-saving recommendations. To reduce the costs of batch processing try the following:

- Jobs run overnight or during weekends obtain dramatic savings. Refer to Section 3.1.
- For applications that require the use of tapes, it may be possible to reduce the number of tape mounts required by some jobs. If a tape is to be used more than once in a step or in multiple steps, proper JCL can minimize the number of times the tape has to be mounted, and therefore, the corresponding tape mount charges. Use the JCL subparameter

RETAIN in the VOLUME parameter and the PASS subparameter of the DISP parameter to ensure, where possible, that a tape remains mounted during and between steps.

- Programs that are run repeatedly should execute a fully or partially resolved load module rather than being compiled each time. For COBOL, FORTRAN, and PL/I, compiler optimization options can provide additional savings.
- Reblocking files can reduce I/O costs. Small blocksizes increase I/O counts.

Terminal Sessions

As with batch processing, an effective way to save money is to use the system during the discount period. Additionally:

- Users can cut costs by storing data economically. Data sets that are no longer of value should be scratched.
- Partitioned Data Sets (PDSs) can be condensed using the RELEASE option with the space allocation.
- Use the NOBACKUP management class for data sets that do not require Computer Center backup.
- Users should examine their tape usage to determine if some data should be stored on disk. The convenience, automatic backup, and low disk charges often make disk an attractive alternative to tape.

Network Services

- Use the NIH Backup and Recovery Service (NBARS) to backup only the files on your workstation that contain critical data.

4 SECURITY AND DISASTER RECOVERY

The Center for Information Technology Enterprise Systems are configured and managed to support applications having security level designations 1, 2, and/or 3 as defined in the DHHS *Automated Information Systems Security Program Handbook*, which can be found at:

http://irm.cit.nih.gov/policy/aissp.html

The DHHS security level designations are based on the sensitivity of data (i.e., the need to protect data from unauthorized disclosure, fraud, waste, or abuse) and the operational criticality of data processing capabilities (i.e., the consequences were data processing capabilities to be interrupted for some period of time or were subjected to fraud or abuse). In summary, the three security levels supported by CIT Enterprise Systems are:

- Level 1—data requires minimal protection because threats to the data are minimal. The primary concern is unintentional alteration or destruction of the data. Interruption of level 1 application processing would minimally affect the organization's function.
- Level 2 —data requires moderate protection because the information has some importance to the organization. The primary concern is malicious destruction or intentional alteration of the data. Interruption of level 2 application processing would not have a critical impact on the organization's function.
- Level 3— data requires stringent security safeguards because the information contains the most sensitive unclassified data (other than unclassified data whose loss could adversely affect national security interests). In addition to intentional/unintentional destruction or alteration, unauthorized disclosure is a significant issue. Interruption of level 3 application processing even for a short period of time would have a severe impact on the organization's function.

Security controls for Titan meet the DHHS requirements for protecting data and applications having level 3 security designations (and by extension, levels 1 and 2). Significant security controls include:

- restrictions on physical access to the facility housing the CIT Enterprise Systems (physical security)
- policies and procedures for ensuring only authorized individuals are granted access to Titan (user registration, see Section 2.2 for details),
- policies and procedures for authenticating users before granting access to Titan (passwords)
- procedures for ensuring tapes and printed output are appropriately protected (input and output controls)
- procedures for ensuring security violations are handled and resolved in a timely manner (security violation monitoring)

- program for ensuring the continuation of operations following an event that causes an extended disruption of Enterprise Systems operations (disaster recovery)
- technical controls for protecting data sets (Resource Access Control Facility (RACF)
- annual SAS70 audits of Enterprise Systems processing level 3 data and applications to ensure the security controls remain effective to protect those data and applications

While CIT is responsible for maintaining a secure operating environment on the Enterprise Systems, individual users are responsible for ensuring that their own data and applications are protected. CIT provides the necessary procedures and tools that enable users to fulfill their security responsibilities.

4.1 PHYSICAL SECURITY

The CIT Enterprise Systems are all housed in the CIT building complex machine room. Physical controls that are in place to restrict access to the machine room include:

- Card key readers are installed on all entrances to the machine room.
- Cardkey access privileges are only granted to individuals who require frequent and regular access to the computers in the machine room.
- Procedures are in place to annually certify the holders of machine room cardkey access privileges.
- Individuals, such as equipment repair persons who must have unescorted access to the computer room, obtain a fading badge which allows access for a limited time.
- Everyone else must display an "Escort Required" badge and be accompanied by a person authorized for unescorted access to the computer room.

Access to the entire CIT building complex is controlled. A security guard is stationed at the main entrance of the complex, 24 hours a day, seven days a week. Anyone entering the building must display a valid government ID showing a current photo identification, or register with the security guard to acquire a temporary visitor's badge. Badge readers control all other external entrances and surveillance cameras monitor building access from 17 different locations.

The machine room equipment is protected from surges or drops in power supply and power interruptions by an Uninterruptible Power Supply (UPS) system. The UPS system is designed to provide all electrical services to the machine room area. When an interruption occurs, power is supplied by a battery backup system which provides up to 30 minutes of operating capability. Beyond 30 minutes, diesel generators provide more than 24 hours of operation per tank of fuel.

The UPS system has more than 50% excess capacity. Moreover, the batteries, monitoring and control equipment, and diesel generators all are configured in three redundant sections.

Failure of any one section will result in no more than a one-third loss of capability, leaving more than adequate capacity to support all ongoing services until power is restored.

The machine room is equipped with smoke detectors and an adequate number of fire extinguishers to contain small fires. The CIT building complex has sufficient fire protection due to its close proximity to the NIH fire department.

4.2 PASSWORDS

Passwords are the keys that allow access to the Enterprise Systems. Therefore, it is important to ensure that strong passwords (not easily guessed) are used and to ensure that passwords are protected from exposure to unauthorized individuals. To this end, password controls enforced on Titan require that:

- passwords be a minimum length of 6 characters
- passwords must be changed every 180 days
- the previous 5 passwords may not be reused when changing passwords

Users can help to ensure that passwords are not easily guessed by following these simple guidelines:

- Construct a mnemonic password; i.e., think of a phrase and use the first letter of each word to create the password.
- Devise passwords that include combinations of letters, numbers, and special characters, preferably embedding the numbers and special characters within the password, not at the beginning or end.
- Do not choose passwords that are the same as the login names (USERids).
- Do not choose passwords with personal associations (e.g., names of relatives or pets, phone numbers, license plate numbers).
- Do not use repeated or obvious sequences (e.g., the same alphabetic character repeated 6 times, alphabetic run, keyboard sequence).

Users can help protect their passwords by adhering to the following:

- Do not write down the password and leave it near your workstation.
- Do not divulge your password to any other individual. As a rule, CIT staff never request user passwords. Exceptions occur when the staff member may need to log on as the individual when all other avenues of problem resolution have been exhausted. If a staff member initiates a contact and requests a password, ask for the individual's name and call back through TASC before fulfilling the request. Be sure to change your password after the problem has been resolved.

- Use emulator software that supports either masking or suppressing the printing of the password as it is entered.

  Change your password more frequently than every 180 days. Passwords can be changed using the Change RACF Password option of Web RACF

Users should be careful when entering their passwords. Repeated errors in attempting to supply a password are logged as a security violation. Excessive failed attempts will cause the USERid to be revoked (i.e., be unusable) until the account sponsor makes a formal response to the violation notification.

If you forget your password, contact your account sponsor to have your password reset.

4.3 INPUT/OUTPUT CONTROLS

CIT processes two categories of tapes: NIH-owned and "foreign," which are owned and supplied by users. The NIH-owned tapes are available for assignment to users for storing data and remain under the control of the tape inventory system, while foreign tapes are outside tape inventory system control.

RACF security protects the data stored on all NIH-owned tapes. Data on foreign tapes is not protected by RACF controls.

Foreign tapes are submitted to the Output Distribution Services counter at the Bethesda campus. Parklawn customers can either put their tape(s) in their output box or slide them under the window at the CIT Offsite Distribution Center located in the Parklawn building (Room 2B-70). All foreign tapes need to be logged-in on the sheet located by the window. If the tape is in an output box, you should indicate which box it is in.

There are two daily courier runs between Bethesda and Rockville—morning (8:00 A.M.) and early afternoon (around 2:00 P.M.)—to pick up and deliver foreign tapes and deliver printed output. All foreign tapes checked in during the week will be returned to your output box the Monday morning following tape check-in.

NIH-owned tapes may not be removed from the NIH Computer Center. Users may copy the information from a NIH tape to either a tape that they supply or from a pool of tapes available for purchase from NIH.

Printed output is placed in the locked boxes outside the computer room. The boxes can only be accessed by users knowing the correct box access code. See Section 5.6.1 for further details on the locked boxes.

Users have the option of printing "PRIVATE" on the header and trailer pages of the printed output containing sensitive information. For more information see Section 5.6 and *Batch Processing and Utilities at the NIH Computer Center*.

4.4 SECURITY VIOLATIONS

CIT monitors the security status of Titan and takes immediate action when an apparent breach of security has occurred. USERids related to any security violation are automatically revoked.

The NIH Computer Center security investigators contact the account sponsor or alternate by telephone and send confirming e-mail detailing the specific circumstances of the violation. The account sponsor is responsible for investigating and resolving the apparent violation. When satisfied that no improper use of the account occurred, the sponsor or alternate can reactivate the USERid through Titan Web Sponsor. No further communication with the NIH investigators is required unless the investigation indicated a security breach did in fact occur.

The NIH security investigators are available to assist with any aspect of the investigation. They may be reached by calling TASC.

If users discover apparent breaches of security, such as discovering that an unknown person may have used their USERid, they should immediately notify their security coordinator or account sponsor. For general security questions contact the CIT Security Coordinator.

4.5 DISASTER RECOVERY

With today's near total dependence on automated information systems to support critical organizational functions, interruption of those services could have severe consequences. Without adequate planning, an organization will have a difficult time recovering from an event that causes a long-term interruption to information system services.

CIT has established a disaster recovery program to provide a foundation for users' disaster recovery planning. The CIT disaster recovery program covers Enterprise Systems that process level 3 data – Titan, South, and EOS. Account sponsors can elect to include their applications in the disaster recovery program by declaring their applications to be critical.

Features of the disaster recovery program include:

- CIT has a contract with a commercial vendor to provide sufficient computer services to support the critical applications at a fully operational data center, a *hot site*, if and when a disaster causes an extended interruption to computer services.
- Every week, CIT creates full volume backups of all Titan system volumes, all database volumes, all private volumes, and all public volumes used for permanent data storage. These weekly dumps are written simultaneously to two separate automated tape libraries (ATLs), one located in the Computer Center and the second located in another building on the NIH campus. Both backups are cycled through five sets of tapes so that five successive weeks worth of backups are always maintained. Data stored on user-owned tapes is not backed up; users are responsible for backing up this data.

- CIT schedules and conducts twice-yearly tests of the disaster recovery plan. Testing occurs over a two-day period with the first day dedicated to testing system recovery procedures and the second day set aside for customers to test their recovery procedures.

In the event of a disaster that requires CIT to move operations to the hot site, CIT will restore the applications and data for the designated critical applications. After the critical applications are operational at the hot site, CIT will attempt to meet the needs of other applications. However, there is no guarantee that other applications will be serviced following a disaster.

The CIT disaster recovery program is detailed in the DCSS *Disaster Recovery Plan*. Contact the Disaster Recovery (DR) Coordinator to participate, to answer any questions regarding the program, or to obtain a copy of the disaster recovery plan. See Section 1.3.1 for the telephone listing.

4.6 SECURITY COORDINATORS

Each user organization must have a security coordinator. This function belongs to the account sponsor until the sponsor designates a security coordinator. (See Section 2.1.) The security coordinator is responsible for the following functions:

- serves as the point of contact for CIT security matters
- implements the account organization's password change policy
- performs RACF functions for users of an account
    - changes passwords
    - revokes and resumes RACF access
    - displays RACF password activity dates
    - sets authorities for RACF group
        - creates and maintains generic profiles
        - designates others to create generic profiles
    - also changes passwords for Helix, ALW, and Parachute accounts

The security coordinator can carry out these functions through Titan Web Sponsor and Web RACF.

4.7 RESOURCE ACCESS CONTROL FACILITY (RACF)

Titan provides comprehensive data security through the Resource Access Control Facility (RACF). RACF is a security system that protects a data set by limiting who can access the data set and how it can be used (e.g., read, update). All data sets created at the NIH Computer Center are automatically protected by RACF through the use of generic profiles.

RACF also controls logon and batch submission. The IBM OS Password Protection facility cannot be used at the NIH Computer Center.

Each organization must assign a security coordinator. The security coordinator is responsible for the implementation standards of RACF within the agency. Users who need password assistance, require access to resources that are not currently available to them, or have other similar RACF problems should contact their security coordinator. TASC cannot help the user in these situations. For additional information about security coordinators, see Section 4.6

RACF documentation is available through the CIT publication ordering service (under the IBM Utilities category). See Section 5.4.1.

4.7.1 RACF Passwords

Each user is assigned a password when registered. This password allows access to batch processing, TSO, ISPF and other Titan services. The password must be 6 to 8 alphabetic or numeric characters and cannot be the same as the USERid. RACF passwords expire every 6 months (180 days). Users can change their passwords through Web RACF (see Section 4.7.4). When a RACF password expires, you may not reset it to any of your 5 previous passwords. Access to a RACF protected data set is limited to the creator, the owner (if other than the creator), and other users who have been specifically authorized.

If the RACF password is forgotten, the user will not be able to logon. Due to the design of RACF, it is impossible to determine the password for a USERid. Account sponsors and security coordinators can reset forgotten passwords for users in their organization through Titan Web Sponsor. If you require further assistance concerning forgotten passwords, contact TASC.

4.7.2 RACF Definitions

Users should be familiar with the following RACF terms in order to use the RACF facilities effectively:

RACFID	the Titan USERid
PASSWORD	a protection for the RACFID. The password is a series of six to eight characters, specified by the user. The password must consist of alphanumeric or national ($, @, and #) characters. Passwords expire automatically after being in use for 6 months; they can be changed through the Change RACF Password function of Web RACF.
RACF GROUP	or RACF Account Group - is the same as the user's account. Each RACFID must be registered to one (and only one) account. A RACF Group may have multiple RACFIDs registered to it.
USER-DEFINED	also called @group - a collection of RACFIDs that can be treated as a

GROUP — single entity for the purpose of data set protection. Each user-defined group has three components: a two-to-eight character name (of the form @name), an owner, and member RACFIDs. RACF groups offer a convenient way to control access to one or more data sets. When you protect a data set you specify an access list of users who will be able to read or update the data set. If the access list includes RACF groups, you can maintain a single RACF group containing the RACFids of persons who are able to access your data sets.

OWNER — the RACFID with the authority to perform RACF functions that no other RACFID can perform. There is an owner for each RACFID, RACF group, user-defined group, and protected data set.

In general, the RACFID is specified as its own owner.

- The owner of a RACF group can authorize other RACFIDs to protect data sets stored under that RACF group. All data sets belonging to the RACF group have the same high-level prefix, which is the account for the data set.
- The owner of a user-defined group is established when the group is established. The owner is the group member RACFID with authority to add and remove members and delete the group.
- The owner of a data set is established through the RACF Profiles area of Web RACF, and is the RACFID of a user who can authorize other users (both individuals and user-defined groups) to access the data set.

The owner is the only person allowed to change ownership. The owner of a data set can be changed in the RACF Profiles area (Change owner of RACF profile) of Web. The owner of a user-defined group can be changed in the RACF Groups area (Change owner of a group) of Web RACF.

UNIVERSAL ACCESS (UACC) — established in the RACF Profiles area of the Web RACF facility. It is used to establish initial protection for the data set. The Universal Access specifies the default access to the data set for users who have not been specifically authorized to access the data set.

The choices are:

NONE	Allow no access
READ	Allow only read access
UPDATE	Allow read and write access

	ALTER	Allow read, write, scratch, and rename access; also allow the user to change the protection of a data set. The UACC can be changed using the Change Owner or UACC (for profile) function.

ACCESS LIST — the list of RACFIDs and user-defined groups that have been authorized to access the data set, and the level of access (NONE, READ, UPDATE, or ALTER) for each. The access list is saved in a system database and is not part of the actual data set. The access list is created and changed through the RACF Profiles area of Web RACF. To display the access list, use the RACF Profiles (Display (RACF profile for a data set)) area of Web RACF. In addition to the authorities listed in the access list, any batch job or interactive session with a RACFID that is the same as the USERid in the high level prefix of a data set will have ALTER access to the data set.

GENERIC PROFILE — a profile that uses special characters (%, *, **) to create a "mask" that is compared against the actual name of a given data set and if matched, grants RACF protection to that data set. The use of generic profiles is highly recommended. See Section 4.7.3.

DISCRETE PROFILE — RACF protection for only one data set. The name of the discrete profile matches the name of the data set protected. See Section 4.7.3.

SPECIAL CHARACTERS (Only one ** special character is allowed per profile). — the set of characters (%, *, **) that are used in the profile name to create a "mask." If no special characters are used, the generic profile only applies to one data set, much like a discrete profile, though using a generic profile to protect a single data set is not recommended.

%	special character matches one character. There may be one or more in a profile. For example, $III.DATA%%%.TEST would protect the data set $III.DATAMIN.TEST.
*	special character matches zero or more characters until the end of the qualifier. It only applies to one qualifier, that is, the generic profile $III.AB.CD* would profile data sets $III.AB.CD or $III.AB.CDEF, but would not protect data set $III.AB.CD.EF. Used as a qualifier at the end of a profile to match one qualifier until the end of the data set name. For example, the generic profile $III.AB.CD.* would protect data set $III.AB.CD.EFG, but would not protect data set $III.AB.CD.EF.GH.

**	special character matches zero or more qualifiers. For example, $III.AB.CD.** would protect $III.AB.CD or $III.AB.CD.EFG, but would not protect the data set $III.ABC.DEF. Note that the ** must appear immediately after a period (.), for example, $III.ABC.DE** would be an invalid profile.

4.7.3 Protecting Data Sets

All disk and tape data on Titan must have a RACF profile. To establish the level of protection needed, use the RACF Profiles area (Protect a data set) in Web RACF. When a new USERid is created, the account sponsor specifies a default level of access (UACC) for all datasets created with that userid as the high level qualifier.

RACF Profiles

There are two methods for protecting data sets with RACF—generic profiles and discrete profiles.

Generic profiles allow users to create a single profile that protects multiple data sets, and to create a profile for a data set that remains in effect even when the data set is scratched and reallocated. Using Web RACF, go to the RACF Profiles (Protect a data set) area to create a generic profile.

By using the special characters %, *, ** in the profile name, you can create a data set "mask" that is compared against the actual name of the data set. If the data set name matches the mask, it receives the protection defined by the RACF profile. If none of the special characters are used in the generic profile, only the data set whose name exactly matches the profile is protected. These characters may be used alone or in combination to produce highly flexible generic profile names.

RACF provides the following benefits for data set protection:

- With RACF generic profiles you can easily specify that all data sets created under a USERid should be automatically protected by RACF when they are created. This capability should be used if it is essential that data be protected at the time of creation (e.g., for sensitive content).
- With RACF generic definitions you can be very selective as to which data sets are protected based on their names, and you can have different generic definitions for different sets of names.
- You no longer have to worry about the number of other people to whom your associates have divulged the keyword.
- Your associates will be given access transparently (if they are authorized to it).

For example, the generic profile

$iii.**

protects all data sets stored under USERid $III. The profile

$III.QRST*.**

protects all data sets stored under USERID $III whose names begin QRST.

When using discrete profiles, the data set must exist at the time it is protected. A discrete profile is created for each data set to be protected. RACF data sets must have "standard" data set names. For information on data set naming conventions, see Section 10.

If you are currently using discrete RACF profiles, you will probably find it more convenient to use generic profiles, if possible. If a data set with a discrete profile is scratched or deleted, the RACF protection also disappears. If the data set is later recreated, no data set protection exits without establishing another discrete profile. Converting to generic profiles is simplified by the fact that if both generic and discrete profiles protect a data set, the discrete profile takes precedence. Therefore, you can create the necessary generic profiles, then DELETE the discrete profiles afterwards. As the discrete profiles are removed, the generic profiles will provide the protection.

The following tables were extracted from an IBM RACF manual and provide a summary of generic profile naming conventions.

Figure 4-1. Generic Profile Names with Special Characters at the End

Generic Data Set Profile Names Created with Enhanced Generic Naming Active—Asterisk and Double Asterisk at the End			
Profile Name	AB.CD*	AB.CD.*	AB.CD.**
Resources protected by the profile	AB.CD AB.CDEF	AB.CD.EF AB.CD.XY	AB.CD AB.CD.EF AB.CD.EF.GH
Resources not protected by the profile	AB.CD.EF AB.CD.EF.GH AB.CD.XY ABC.DEF	AB.CD AB.CDEF AB.CD.EF.GH ABC.DEF	AB.CDEF AB.CDE.FG ABC.DEF
Profile Name	AB.CD*.**	AB.CD.*.**	
Resources protected by the profile	AB.CD AB.CD.EF AB.CDEF AB.CDEF.GH AB.CD.EF.GH AB.CD.XY	AB.CD.EF AB.CD.EF.GH AB.CD.XY	
Resources not protected by the profile	ABC.DEF	ABC.DEF AB.CDEF AB.CDEF.GH AB.CD ABC.XY.XY.EF	

Source: *The Resource Access Control Facility; RACF Command Language Reference, Version 1, Release 9* (Appendix A) IBM, SC28-0733-12

Figure 4-2. Generic Profile Names with Special Characters in the Middle

Generic Data Set Profile Names Created with Enhanced Generic Naming—Asterisk and Double Asterisk, or Percent Sign in the Middle			
Profile Name	ABC.%EF	AB.*.CD	AB.**.CD
Resources protected by the profile	ABC.DEF ABC.XEF	AB.CD.CD	AB.CD AB.X.CD AB.X.Y.CD
Resources not protected by the profile	ABC.DEFGHI ABC.DEF.GHI ABC.DDEF	AB.CD AB.CD.EF AB.CDEF ABC.DEF ABC.XY.CD ABC.XY.XY.CD	AB.CD.EF AB.CDEF ABC.X.CD.EF ABC.DEF ABC.YCD

Source: *The Resource Access Control Facility; RACF Command Language Reference, Version 1, Release 9* (Appendix A) IBM, SC28-0733-12

4.7.4 Web RACF

Registered users of Titan can access the RACF facility from the Web and issue RACF commands from any browser. To access Web RACF for Titan, go to:

https://titan.nih.gov/racf

Titan users can submit information through the Web and Web RACF formats all RACF commands. Commands are sent to the OS/390 system for processing and a response is returned indicating successful completion or an appropriate RACF message.

Users must have a valid Titan USERid and OS/390 password in order to submit any RACF request. In addition, the USERid entered must be authorized to perform any RACF function requested. Generally, this means that only the owner (creator) of a data set can change RACF access to that data set.

Among its functions, Web RACF allows users to:

- change the RACF password
- permit individual, universal, and group access to mainframe data sets
- set up generic profiles for data set protection
- change the Universal Access (UACC) for a profile
- change the owner of the profile
- view the RACF profile of a mainframe data set

Web RACF allows security coordinators to:

- revoke a user's access
- resume a user's access
- set a password for a user
- display information for a user

4.7.5 TSO RACF Commands

The RACF commands available to the user under TSO are:

ADDSD	add RACF protection to an existing data set to control access to it
	define to RACF a data set that is brought from another system where it was also RACF-protected
ALTDSD	modify the existing profile of a RACF-protected data set
	protect a single volume of a multi-volume, non-VSAM data set (At least one volume must be RACF-protected.)
	remove RACF protection from a single volume of a multi-volume, non-VSAM data set (The last volume cannot be deleted from the profile.)
ALTUSER	change the name field or default group
DELDSD	remove RACF protection from a data set
	remove a data set profile when moving a RACF-protected data set to another system that has RACF support
LISTDSD	list details of data set profiles
PASSWORD	change the current password to a new one
	change the time interval the password is valid
PERMIT	grant level of access to a resource to specific RACF-defined users or groups
	remove authority to access a resource from specific RACF-defined users or groups

change the level of access to a resource for specific users or groups

copy the list of authorized users from one resource profile to another and modify the new list as required

Level of Access
The following operands define the levels of access that a user may have over a given resource:

READ	The specified user or group can access the resource for the purpose of reading only.
UPDATE	The specified user or group can access the resource for the purpose of reading or writing.
ALTER	The specified user or group has control over the resource and can authorize other users and/or groups of users, access to the resource.
CONTROL	This access authority used only for VSAM data sets. The specified user or group has access authority that is equivalent to the VSAM control password. The VSAM control password allows a user to perform control interval access and to retrieve, update, insert, or delete records in a VSAM data set.
NONE	The specified user or group is denied access to the resource.

Entering RACF Commands
RACF commands can be entered through the Web, TSO or batch. A cataloged procedure, BATCHTSO, is available for entering RACF commands in a batch job. The formats for the RACF commands are the same in TSO and batch. The TSO convention governing the use of single quotes around data set names applies (i.e., a data set name enclosed in single quotes will be processed as entered, but a data set name not enclosed in single quotes will have the TSO USERid ($iii) added as a prefix automatically before processing). If the latter method is used, a PROFILE statement must precede the RACF command.

The use of BATCHTSO is illustrated in the following example:

```
//STEPNAME EXEC BATCHTSO
//SYSIN    DD *
PROFILE    PREFIX($III)
  (RACF commands)
       "
/*
```

Any number of RACF commands may follow the SYSIN DD statement.

Changing a Password
To change your password:

- Use Web RACF (see Section 4.7.4). This is the preferred method.
- At the TSO Logon panel, enter a new password in the New Password field.

```
New Password ===> newpass
```

  For details about the TSO logon panel method, see Section 7.2.1.

- Enter the RACF "PASSWORD" command during a TSO session.

```
PASSWORD PASSWORD(oldpass newpass)
```

- Submit the RACF "PASSWORD" command in BATCHTSO.

```
//STEPNAME EXEC BATCHTSO
//SYSIN    DD *
PASSWORD PASSWORD(oldpass newpass)
```

Allowing Individuals or Groups to Use a Protected Data set
The PERMIT command is used to grant a specific level of access to other users of a data set. The command can be entered by anyone with the ALTER level of control for the data set. The command is shown in the following example:

```
PERMIT dsname ID(xxx...) ACCESS(level of access)
```

Where: "xxx" may be user-id "$iii" or account "aaa." Multiple user-ids or accounts may be specified in the ID field in the form ID(xxx,yyy,zzz...) with separating blanks or commas. Level of access entries and meanings are described under "Level of Access," earlier in this section.

Allowing Universal Access to a Protected Data set
The ALTDSD command with the UACC operand is used to grant a specific level of access to a data set for **all** users. The format is:

```
ALTDSD datasetname UACC(access-authority)
```

RACF Messages
Messages are issued by RACF when the various RACF processors detect errors or other conditions that prohibit granting a user access to the system or to a particular resource according to the established protocols. The Titan RACF messages are included in the manual, *Batch Processing and Utilities at the NIH Computer Center*.

4.7.6 Tape Data Security

Tape data set security on Titan is handled by RACF permissions on a data-set rather than volume basis. Data set protection depends on the RACF profiles in place and applies to any data set, regardless of whether it is on tape or disk.

If an agency wishes to use the former tape naming conventions of aaa.iii.dataname, the security coordinator must create RACF profiles of the form aaa.iii.** and must permit the $iii USERid ALTER access to that profile. Optionally, the security coordinator can set the owner for the aaa.iii.** RACF profile as $iii. This allows the $iii user to use RACF commands to permit other users access to data sets on tape. Unless these RACF permissions are given, the generic profiles currently in use for disk data sets will be used and some tape jobs may fail.

5 USER SUPPORT

This section discusses the many types of assistance available to users to help them make efficient and effective use of the OS/390 Titan system of the NIH Computer Center. The CIT Technical Assistance and Support Center (TASC) supplies many of these services with support from the staff of the NIH Computer Center. See Section 1.3.1 for useful phone numbers. This section also describes adjunct services to handle and distribute output. Other services provided to customers of the NIH Computer Center are described in Section 1.1 under the individual descriptions of the organizational components of CIT.

The comprehensive consulting services offered to customers by CIT include problem resolution, as well as debugging assistance and diagnostic interpretation. Consulting is available on connectivity strategies and services, including interactive login and file transfer services that are part of NIHnet. Consultants are also available when a system problem occurs that prevents a user's work from continuing—a situation which requires a quick response for a solution/circumvention.

Submit an OS/390 Service Request Ticket to report problems, make suggestions, apply for refunds, and request consulting assistance. OS/390 Service Request Tickets can be submitted through the World Wide Web at:

http://datacenter.cit.nih.gov/srt

or by e-mail. See Section 5.2.2 for further information.

The CIT Computer Training Program offers classroom and self-study courses specifically designed to teach students how to use the services of CIT and the NIH Computer Center. CIT also provides documentation describing the services provided by the NIH Computer Center. See Section 5.4 for information on ordering publications.

Be sure to consult the CIT Web pages for additional information on specific services. Go to:

http://cit.nih.gov

5.1 SOFTWARE SUPPORT

The CIT's Technical Assistance and Support Center (TASC) offers consulting and assistance on a variety of software and services. TASC will try to answer questions on any product used by CIT customers. Titan software and services, specifically documented in this guide, receive a high level of consulting. Support comes in the form of responses to OS/390 Service Request Tickets (SRTs), technical documentation, maintenance, advance announcement of all changes, and full conversion support (if the product is upgraded or discontinued).

Figure 5-1 lists software facilities available to Titan customers for application development.

The South System transition to Titan is now in progress. Additional South System software will become available on Titan in the near future.

Figure 5-1. Supported Software

Category	Software Facilities	Section
Operating System	OS/390 Operating System and Job Control Language	7.1.1
SILK Web Facilities	Public and secure servers CIT SILK applications	7.5.2
Data Base Technologies	Model 204 (Fast Unload, Fast Reorg)	7.3.2
	ADABAS	7.3.1
	Neon Shadow Direct (ODBC)	
	Neon Shadow Web Server	
	Oracle SQL *Net	7.3.3.1
	Oracle client services	7.3.3.1
Interactive Systems	CICS	7.2.2
	TSO	7.2.1
	ISPF	7.2.1.1
	MAX	7.2.1.2
	MVS/QuickRef	7.2.1.3
	ACS WYLBUR	7.2.3
Programming Languages	PL/I for OS and VM	7.4.3
	COBOL/370	7.4.1
	High Level Assembler	7.4.4
	REXX	7.4.5
	VS FORTRAN	7.4.2
Scientific Statistical Systems	SAS	7.6.1
	SPSS	7.6.2
Connectivity/Network	CONNECT:Direct	6.4.4
	QWS3270 PLUS	6.2.2
	WS_FTP Pro	6.4.1
	NBARS (ADSM/TSM Software)	10.3
	IND$FILE	6.4.5

Category	Software Facilities	Section
Other	BookManager	7.8
	IOF	7.7
	VPS printing service	6.5.4
	VISION:Builder[4]	7.10
	IRS[5]	7.10
	DXUTIL	8.5

[4] Limited support from CIT

[5] Limited support from CIT

5.2 CONSULTING SERVICES

Consulting services are offered to all registered users, without charge, through the CIT Technical Assistance and Support Center (TASC).

5.2.1 Telephone and Walk-in Assistance

The CIT Technical Assistance and Support Center (TASC) provides telephone and walk-in consulting on the services and facilities supported for the Enterprise Systems. Call (301) 594-6248. TASC is located in building 12A, Room 1011 on the NIH campus. Refer to Section 1.4 for the hours of operation. TASC can also be reached at the e-mail address tasc@nih.gov. Consulting assistance is available on all software supported by the Computer Center.

The TASC consultants can answer most questions, but will refer more complex problems to subject matter specialists. The expertise and experience of the senior staff members are available to any Computer Center user who calls the CIT Technical Assistance and Support Center (TASC).

Regardless of the software you are using, if you think that an action you are taking at a terminal or a batch job you are running is causing the system to crash, you must contact TASC immediately. If you cannot reach TASC, submit a "Critical" OS/390 Service Request Ticket and suspend all action until you are notified. Do not try to modify the command or job and resubmit it. (See Section 5.2.2 for information on submitting OS/390 Service Request Tickets.)

Users who plan to acquire or develop large systems at the NIH Computer Center should contact CIT to set up a meeting to discuss the proposed software in detail. This will help ensure that the new system will adhere to the job standards and will not conflict with published restrictions.

Questions concerning LANs, networking and NIHnet (e.g., electronic mail addressing, communications with the Enterprise Systems using the TCP/IP protocol, and network connectivity strategies) can be handled through TASC.

As an additional way to ensure full support for network users, each LAN connected to NIHnet has a technical LAN coordinator. Users on a LAN connected to NIHnet who have connectivity problems should first contact their TLC for assistance. The TLC will work with CIT in the event of a networking or connectivity problem between a LAN and its NIHnet connection. For more information on technical LAN coordinators, see Section 5.2.3.

5.2.2 OS/390 Service Request Ticket

Users can report problems and request refunds, as well as communicate suggestions, comments, and needs to CIT through an OS/390 Service Request Ticket (SRT). The information from these reports help the staff formulate future policies, plan systems changes,

and inform users of common trouble areas. OS/390 Service Request Tickets can deal with supported software, hardware, network connections, or service for Enterprise Systems (including OS/390) facilities. The staff will not be able to respond to problems with software or hardware (e.g., workstations) not supported directly by CIT. Users who submit SRTs should expect responses by telephone or by electronic mail.

5.2.2.1 Submitting an OS/390 Service Request Ticket

Every OS/390 Service Request Ticket (SRT) should include a complete description of the problem. Section 5.2.2.2 describes the documentation that should accompany an OS/390 SRT. If users wish to cancel an OS/390 SRT (e.g., the problem has been solved or they no longer require an answer), they should notify TASC immediately via phone or by submitting another report to cancel the previous SRT.

SRTs are tracked internally by Remedy's Action Request System (AR). This system automatically creates a "ticket" that is associated with a user's problem. When you submit an SRT, the system will notify you of the number for the Remedy "ticket" for future reference.

There are several methods of submitting an OS/390 Service Request Ticket.

- **World Wide Web**

  Users with NIHnet or Internet connections can report a problem through the World Wide Web. Connect to:

  http://datacenter.cit.nih.gov/srt

- **Electronic Mail**

  OS/390 Service Request Tickets can also be submitted by sending electronic mail to tasc@nih.gov.

5.2.2.2 Providing Documentation for an OS/390 Service Request Ticket

For any OS/390 SRT, whether submitted via e-mail or the World Wide Web, the description of the suggestion, problem, or complaint should clearly, but briefly, explain the area of concern. The problem description should include all information (for example, data set names, job numbers, etc.) needed to resolve the problem.

Submitters should be certain to include their own names and correct telephone numbers on the SRT since TASC frequently must contact the individual before being able to resolve a problem.

The amount of documentation needed depends on the severity, complexity, and nature of the problem. For printing problems, extensive listing may not be required. Often the output

header and trailer sheets and a few pages showing the problem are sufficient to determine the problem.

5.2.2.3 Requesting a Refund

To obtain a refund, a user should submit an OS/390 SRT, either by e-mail or through the Web. See Section 3.2.2 for more information about refunds.

5.2.2.4 OS/390 Service Request Ticket Priority and "Critical" Tickets

Under certain circumstances an OS/390 Service Request Ticket can be designated as "critical"—i.e., the problem being reported requires immediate attention or is critical to day-to-day production system computing tasks. When submitting this type of SRT via the Web, select the "critical" button.

Critical OS/390 Service Request Tickets are examined frequently throughout the workday, and every effort will be made to provide a "fix" or circumvention within a week of receipt of all necessary information. Whenever possible, a temporary solution or bypass for the problem will be provided. Non-critical SRTs are examined each workday and addressed as quickly as feasible. However, because of workloads and resource limitations, up to four weeks may be required before a final resolution is provided.

Before submitting a critical OS/390 Service Request Ticket, it is often useful to discuss the problem with the TASC consultants. A problem can be considered critical if it severely impacts production (not test or development) work and cannot wait, or if you suspect that your batch job or session has adversely affected the NIH Computer Center. The one-week response to critical problems can be offered only if it is not abused. Permanent fixes typically take longer since they must be supplied by the software developer or vendor.

5.2.3 Network Assistance

The CIT Division of Network Systems and Telecommunications (DNST) monitors network services equipment at the NIH Computer Center. Users experiencing problems involving communications, telephone circuits, and terminals should report them by calling TASC.

NIHnet assistance is available through the technical LAN coordinators (TLCs), who are the LANs' representatives for coordinating the connection of all LANs to NIHnet and providing input for future NIHnet enhancements. TLCs serve as the primary contact between the users of the LAN and CIT. The TLC will be contacted in the event of any problems or questions related to the LAN's connection to the wide area network. NIHnet provides connectivity services to LANs over a wide area, both on and off campus. Support for the NIHnet wide area network requires a collaborative effort between CIT and TLCs.

If problems arise when using NIHnet connectivity services on a LAN, the TLC is the first person who should be contacted for help. The TLC is very familiar with the LAN and is kept informed of the overall network status, including planned outages.

Other essential tasks of TLCs include assigning Internet Protocol (IP) addresses on TCP/IP LANs and keeping NIHnet records accurate.

Users can find out the name of their TLC by contacting the Technical Assistance and Support Center (TASC) or by pointing their World Wide Web browser to:

http://www.net.nih.gov

and selecting "Networking Tools."

5.2.4 Database Assistance

There are additional forms of assistance available on database technologies. Contact the Database Technologies staff for telephone assistance. Refer to Section 1.3.1 for the Computer Services Directory.

For more information on database systems supported on Titan, use the World Wide Web to connect to:

http://titan.nih.gov

5.2.5 Assistance for Implementing Non-NIH Software

Users who are considering, or are in the process of acquiring or developing, a software package should contact CIT to arrange a meeting to discuss implementation. The purpose of this meeting is twofold:

- To ensure that the proposed software will comply with the NIH Computer Center standards and will not have a detrimental effect on other users. This compliance is mandatory in the open-shop environment at NIH.
- To help the NIH Computer Center staff project the resource requirements of the user community as a whole (e.g., additional resources such as online disks, etc.).

If a large system is designed without prior consultation with the appropriate Computer Center personnel, it may require extensive modification before it is implemented, or it may not be able to run at all. Avoiding the necessity of "after the fact" changes can result in the savings of substantial cost, staff-hours, etc. In addition, the prior consultation will often result in a more efficient, bug-free and more easily maintained system.

If possible, representatives of the vendor should be present together with the user, so that they can gain an insight into the NIH environment and, along with it, a more accurate estimate of the work it will take to make the system compatible with NIH's standards. The staff will help the vendor plan the changes and installation of the system. Such a meeting,

held early in negotiations with the vendor, is an important step in insuring a smooth, economical, and hopefully rapid installation of the vendor's system.

The use of device-dependent data or programs should be avoided whenever possible; software packages using these features could become unusable later if the NIH Computer Center upgrades its hardware.

Some software vendors charge for the use of their software based on the number of processor complexes on which the package may run. They may require the purchaser to supply processor complex serial numbers that are then checked by the software. The NIH Computer Center's configuration is relatively dynamic. Acquisition of a new processor complex, and particularly changes or additions to processor complex serial numbers cannot be announced in advance. Any contract to acquire software should include some allowance for the possibility of additional or replacement processor complexes.

Transferring disk data to the NIH Computer Center from other computer centers (which is done via tape) should be done using individual data sets. Attempting to restore data from a backup tape will often be unsuccessful because of hardware and software incompatibilities. See Section 6.4.6 for details.

For a list of the operating system software that cannot be used at this installation, see Section 7.1.1.2.

5.2.6 Telecommunications Assistance

TASC (the CIT Technical Assistance and Support Center) provides advice and assistance to users with a wide variety of telecommunications and connectivity problems. Users who suspect that communications hardware maintained by CIT may be causing their problems can contact TASC. CIT can provide help with:

- mainframe connections via telnet
- Parachute (modem service and ISDN service)
- dedicated phone lines
- mainframe dialup ports
- modems
- DSUs/CSUs (data service units/channel service units)
- 3270 communications
- SNA cluster controllers
- RJE communications
- LAN connections (communications problems)
- JES2/NJE node connections
- NIH telecommunications services (including NIH telephone systems and services)

TASC can help users resolve hardware incompatibility problems with supported connectivity software. TASC also handles many of the telecommunications issues when connecting LANs to NIHnet. They analyze the source of communications link problems with networks. They

also carry out SNA/SDLC and 3270 device registrations and help users set up communications links for 3270-compatible terminals.

To register a terminal, contact TASC. At the time of registration the owner of the terminal will be required to specify all the options and features installed on the terminal. Users having a requirement for terminals that are not supported at NIH should contact TASC for assistance. If the equipment is **not** compatible, alternative solutions will be offered.

A user negotiating with a vendor for a terminal not specifically identified in Section 6 should ensure that the vendor substantiates all claims that the terminal is compatible with one of supported types. The user should require the vendor to support all compatibility claims with live demonstrations prior to initiating procurement activities.

5.3 TRAINING

The CIT Computer Training Program offers a variety of classroom courses to assist users in making effective use of computers at NIH. Many seminars address the uses of computers in science. A variety of self-study courses are also available. Descriptions of all classroom courses, seminars, and self-study courses provided by the CIT Computer Training Program are available through the World Wide Web. Course information is kept up-to-date; when a course fills early and a new session is scheduled, it will be shown. You can register for a class through an online application form. For training information and registration go to:

http://training.cit.nih.gov

As a convenience to NIH personnel, the CIT Computer Training Program Web site has links to other computer training programs available at NIH.

The training staff can answer any questions about these courses and give assistance in selecting the best course to fill specific needs. Contact TASC if you have any questions. There is no charge for courses in the CIT program, and application is made through the World Wide Web or on a simple one-page online form (which can also be mailed or faxed).

The CIT Computer Training Program fully accommodates students with disabilities. Classes are located in a wheelchair-accessible building. People with disabilities are welcome to attend any course or seminar offered by the CIT Computer Training Program for which they have the appropriate professional background. Prospective students should inform the training staff if special assistance will be needed. For more information, see Section 1.7.

5.3.1 Classroom Training

There are three terms each year: fall, spring, and summer. Subjects include: personal computers, networks, Internet resources including World Wide Web facilities, OS/390 systems, computer security, database topics, Unix, SAS, NIH Data Warehouse information, and scientific seminars.

Whenever possible, special seminars will be scheduled to meet the needs of organizational groups. For information on scheduling a special seminar for your group, contact the staff of the CIT Computer Training Program through TASC.

5.3.2 Independent Training

A variety of self-instruction methods are offered for students who want to study independently. Full details and a complete list of independent training courses can be found at the CIT Computer Training Program Web site.

5.4 DOCUMENTATION

CIT offers a wide variety of online and hardcopy documentation to its users.

5.4.1 CIT Publication Ordering Service

The CIT Technical Information Office provides manuals and updates for CIT supported systems and software. To order hard copy publications, view publications online, print manuals on the high-speed central printers (South System and Unix users only), or print at your desktop printer, visit:

http://publications.cit.nih.gov

For users with only Titan USERids
To submit a request for hardcopy documentation, please fill out the online order form from the CIT publications Web page.

Titan users cannot yet take advantage of all the features of the online View/Print On Demand Service. The services described below that are available to Titan users are marked with an *.

For users with South account/initials combinations or a Unix username/login
Each CIT or vendor document on the CIT publication pages is available through one or more of these options. To get started, select a category from the list on the left side of the CIT Publications page. After clicking on the title, you will see the list of available formats.

- online viewing via the View/Print On Demand Service via the Web in PDF format via Acrobat reader (with the option of printing at your local desktop printer). This is a free service. *
- central printing via the View/Print On Demand Service

  Many vendor manuals and CIT-written manuals can be printed in-house—double-sided, three-hole punched, on high-speed laser printers The system prompts users for their CIT account/initials combination and passwords or Unix username/login to process orders. One hard copy of each technical manual is provided free of charge to registered CIT customers. Users will incur charges when they request the printing of more than one copy of a manual at the central printers. Additionally, there is a charge for statistical software.

- view via a Web browser online. *
- hardcopy (traditional method). Some manuals (specific vendor manuals and older CIT manuals) are only available through the traditional ordering system. You must supply your CIT account/initials and password, or Unix username/login. There is a choice of delivery options
    - to your output box
    - by mail (within 24 hours)
    - personal pickup at TASC. (See Section 1.3.1)

Users must verify (and correct if necessary) their customer information before placing an order online for a printed copy of documentation. Contact TASC for assistance with ordering or printing documentation.

You may subscribe to a publications interest list, and receive e-mail notification whenever a new manual is available. Go to the NIH Listserv page (http://list.nih.gov). Browse the list of listserv lists and select the CIT-DOC-RENEW list. Updates are not distributed unless they are specifically requested.

Anyone making active use of the NIH Computer Center is responsible for obtaining and consulting the publications related to the services being used. The CIT publication ordering service allows users to update the address and telephone information so publication updates can be mailed efficiently.

User groups with many individuals at a single location are encouraged to establish a library of publications to be shared by the group. Each user may still obtain a personal copy of the publications used most frequently.

Almost all publications are given to users without charge. The NIH Computer Center absorbs the cost in its overhead (which is in turn paid for from computer charges). To be cost effective, some limits must be put on the documentation service. Each user should order only the publications currently needed; if others are needed later, they can be ordered at any time. An order for an unreasonable number of publications (e.g., one of every publication stocked) cannot be filled and will be delayed until the user can be contacted to determine which publications are really necessary. Each request for a special order of documentation is reviewed as it is received. Publications not listed in the online publications system will be given to a user only if the document describes facilities offered at the NIH Computer Center to its user community.

People who are not registered users may receive introductory publications. Requests from non-users for any other NIH Computer Center publications should be directed in writing to the Director, Division of Computer System Services.

If you have any questions concerning ordering documentation, contact TASC.

5.4.2 Online Documentation via BookManager

Use IBM BookManager on Titan to view online IBM technical documentation. Access the Titan system and connect to NIHTSO. Logon with your USERid and password. After the informational messages appear, hit Return. From the CIT/Titan Primary Option Menu, select C for Products, and then select B for Books (BookManager).

For more information on BookManager, see Section 7.8.

5.5 CONTACT BETWEEN USERS AND CIT

The training and consulting services described earlier in this section comprise two-way communication between users and the NIH Computer Center. Input from users is a critical element in determining Computer Center goals, policy, and allocation of staff time. It greatly affects the quality and timeliness of the end products provided to the user community. The CIT Technical Assistance and Support Center (TASC) provides information on setting up accounts, training, software, e-mail and a full range of technical issues. Suggestions on how to improve our service are always welcome. The OS/390 Service Request Ticket, described in Section 5.2.2, is an important communication tool for users who need help. Publications, such as *Interface*, are effective vehicles for Computer Center-user communication. The communication tools described in this section complement the general links described above.

5.5.1 Titan/South System News

An important means of communicating timely information with OS/390 Titan and South System users is "Titan/South System News." It is distributed through an e-mail list, CIT-TITAN-NEWS@LIST.NIH.GOV. This service allows CIT to send out important information, such as updates on outages, special events, equipment and software upgrades, technical information and other issues, at short notice.

Subscribers to the *Interface* Listserv list receive these notices automatically. For information about Listserv, or to join or leave a list, go to:

http://list.nih.gov/

5.5.2 Electronic Mail

Electronic mail is a standard means of communication between users and CIT. Listserv lists offer users a way of subscribing to information relating to a particular topic. Find out more about the NIH Listserv service at:

http://list.nih.gov

Users should review their electronic mail on a regular basis. In many cases, this is the sole means of communication with users, therefore, make a regular reading of mail a vital part of your investment in mainframe computer and NIHnet use.

For information on the NIH Directory and E-mail Forwarding Service, see Section 1.3.2.

Anyone who needs assistance, or who receives mail from the NIH Computer Center that is confusing or unclear, should simply call TASC. Communication is an integral part of our services. We welcome comments and ideas on possible ways that it could be improved.

5.5.3 Message Facilities

Occasionally, in a computer center environment, changes to a published procedure must be quickly implemented. Titan has several methods for timely communications with its users:

Hot News
Hot News provides TSO and batch users with up-to-date information concerning changes in operating schedules, and published procedures. Information on software enhancements and scheduling of user group meetings can also be found in Hot News.

Hot News can be invoked from TSO with the command:

```
HOTNEWS
```

System Broadcast Messages
A specific system, such as TSO, may send messages to all users of that system. Since this message facility is a feature of the individual system, only information of interest to the users of a particular system is broadcast in this manner.

Batch Listing Messages
Titan messages are displayed on Titan batch listings.

5.5.4 CIT-Sponsored Users Groups

There are several other CIT-sponsored groups to help users exchange information in specific areas of interest. Contact TASC for further information. These groups include the following:

- Biomedical Research Mac Users Group (BRMUG) - Macintosh user support
- Molecular Modeling Interest Group - seminars on various molecular modeling topics to foster communication between NIH scientists concerning the methods and applications of molecular modeling
- World Wide Web Interest Group (WIG) - effective use of the Internet and the World Wide Web in support of NIH functions

5.6 INPUT/OUTPUT DISTRIBUTION SERVICES

Jobs submitted locally or interactively without a "ROUTE" or "DEST" statement are printed at the Bethesda campus of the NIH Computer Center. Jobs submitted at an RJE station unless specifically "routed" to an alternate site will normally print at that RJE station. Customers in the Parklawn building can continue to use the CIT Offsite Distribution Center at Parklawn (room 2B-70). For information on the courier service for the Parklawn building, see Section 5.6.1.2.

Computer output is either placed in assigned combination lock boxes or in "special handling" boxes. The lock boxes are accessible to only those users who have been given the combination by their respective account sponsor. Large volume output and "PRIVATE" output, constitute the "special handling" category. "Special handling" output at the Bethesda campus is distributed at the Output Distribution Services counter in building 12A. A color-coded card in the lock box will notify users when this material is at the counter. Before such output is released, the user must request it by job name and provide personal identification. "PRIVATE" output must be signed for by the user or by a designated representative.

The CIT Operations staff will call users at the Parklawn site when large volume output is ready to be delivered to Parklawn. "PRIVATE" output for Parklawn is handled on an individual basis. Please contact Output Distribution Services for details.

5.6.1 Output Boxes

CIT has output boxes available for its users at the Bethesda campus site and at the Parklawn building.

5.6.1.1 NIH Bethesda Site

There are locked output boxes at the Bethesda NIH campus—located next to the Output Distribution Services counter in building 12A. To access an output box you must enter the BAC (box access code) at a keypad located by the bank of output boxes. Contact TASC for information on obtaining an output box.

Boxes for Mailed Output

Users at a remote location should obtain a mailing box number (with an "M" prefix) so that output produced at the central facility can be mailed to them. Users who choose this service must accept full responsibility for delays, damage, or loss incurred in the mails and must limit the volume of output to be mailed to that which will fit in one 12 by 16 inch U.S. mail envelope (NIH Supply Number 7-7106). Box numbers are limited to 4 characters, including the M prefix.

5.6.1.2 Parklawn Site

All Titan output is printed at the NIH Bethesda site.

All Titan USERids propagated from the former North System have a default output box, located at the Parklawn site, with a number prefaced by a P (for Parklawn). If you run a batch job on Titan, the output is routed to your Parklawn box number unless you specify otherwise by means of a `/*BOX` statement in your JCL. However, if you include a `/*BOX` statement, you need to include the P, since the `/*BOX` statement will override any default box number.

Note: The output will be placed according to the box number only. For example, if a job contains a `/*ROUTE OUTPUT NIHCU` statement but the box number begins with a "P," then the output will be placed in the box at Parklawn.

Courier Service

A courier service, provided by the NIH Computer Center, transfers tapes and printed output between the Bethesda campus and the Parklawn building. This service operates twice daily each weekday, arriving at Parklawn at around 8:00 a.m. and again around 2:00 p.m.

5.6.2 Misdirected Output

Occasionally output is misdirected because of a user error or mishandling by the NIH Computer Center. This can cause great frustration for the user who should have received it. If you locate misdirected output, please inform Output Distribution Services, on the NIH Bethesda campus building 12A, as soon as possible. See Section 1.3.1 for the telephone number.

6 NIH CONNECTIVITY AND NETWORK SERVICES

CIT provides both network and dialup connectivity to Titan services. However, users with NIHnet connections or Internet (TCP/IP) connectivity should take advantage of the high-speed network connections instead of using slower dialup (modem) connections. This section provides descriptions of the software products supported by CIT to provide that access and an overview of some of the network services provided at CIT. Contact TASC for all connectivity assistance, including software recommendations.

The Online Services Directory (Section 6.1) provides the Internet host names for network connections and the dialup access telephone numbers.

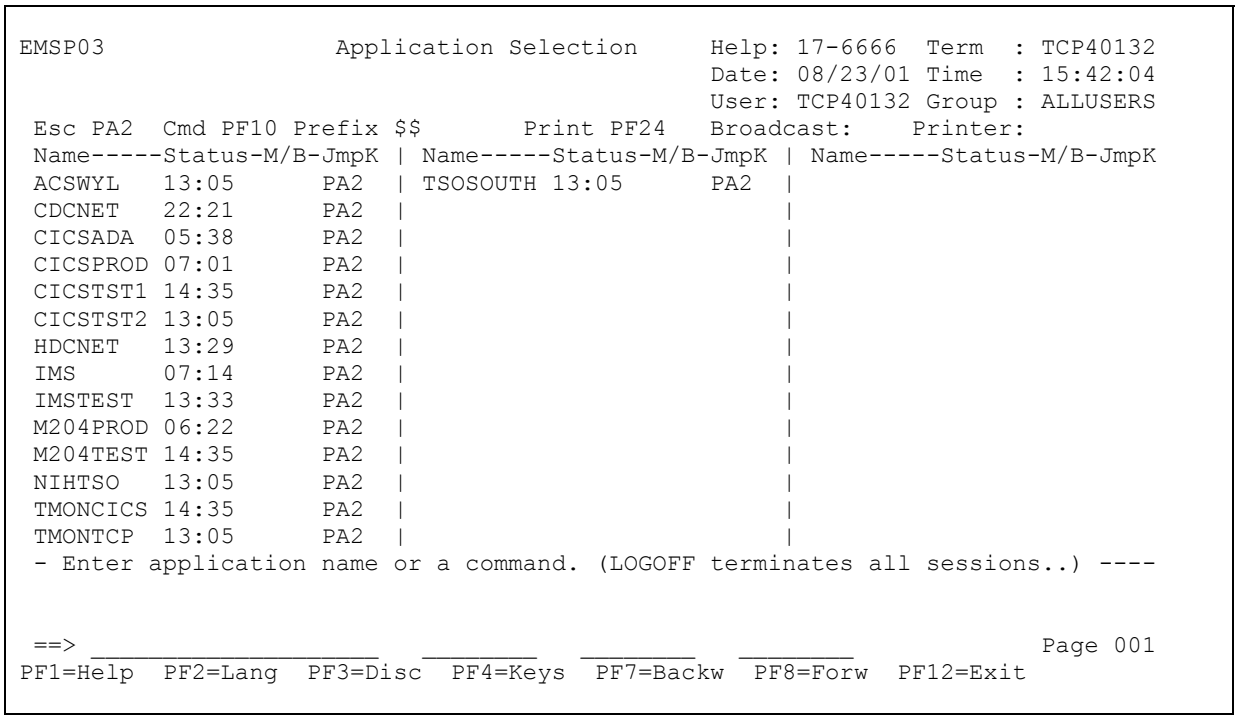
6.1 ACCESS TO SERVICES

Figure 6-1. Online Services Directory

Service	Internet Host Name	Dialup Access (301)	Status (301)
OS/390 - South			
WYLBUR (network)	**WYLBUR.CU.NIH.GOV**	402-2221	402-2211
2400-19200 bps (dialup)		*800-358-2221	
TSO (network)	**TSO.CU.NIH.GOV**	402-2223	402-2211
2400-19200 bps (dialup)		*800-358-2223	
TSO, DB2, IMS	**TN3270.CU.NIH.GOV**	402-2227	402-2211
(Full-Screen 3270) (network)			
2400-9600 bps (dialup)			
IBM Batch (RJE Batch)	**N/A**		402-2211
2400-9600 bps		402-2228	
Network File Transfer	**FTP.CU.NIH.GOV**	N/A	N/A
OS/390 - Titan			
(Standard System)			
TSO (Full-Screen 3270)	**TN3270.TITAN.NIH.GOV**	N/A	402-2211
RJE Batch	**N/A**	480-0744	
2400-9600 bps (dialup)			
Full-Screen 3270	**N/A**	480-0748	402-2211
2400-9600 bps (dialup)			
			402-2211
Network File Transfer	**FTP.TITAN.NIH.GOV**	N/A	402-2211
Enterprise Open Systems (Unix)			
Compaq/Digital AlphaServers	**EOS.NIH.GOV**	N/A	402-2212
Helix Systems			
SGI Challenge System	**HELIX.NIH.GOV**	402-2222	402-2212
2400-33600 bps		*800-358-2022	
NIH Biowulf Cluster	**BIOWULF.NIH.GOV**	N/A	402-2212
NIHnet access through Parachute	**N/A**	402-6830 *800-827-0124	594-6248

NOTES:
To access 402, 435, 443, 451, 480, 496, 594, or 827 numbers from other 402, 435, 443, 451, 480, 496, 594, or 827 numbers, use only the last 5 digits.
N/A: Not Applicable
All telephone numbers are accessible through FTS.
*These 800 numbers should be used only by persons who do not have access to FTS2001.

After you connect to Titan, the Application Selection (NetView Access) screen appears. Select NIHTSO to access most Titan services. See Section 7.2.1 for additional access information under NIHTSO.



6.2 INTERACTIVE ACCESS

Network facilities provide communication between users and remote computer facilities, including accessing the online systems. Network file transfer is discussed in detail in Section 6.4. Users with NIHnet or Internet (TCP/IP) connections are encouraged to use network access whenever possible.

NIHnet is a high-speed network backbone that interconnects LANs on and off campus, the NIH Computer Center mainframes, and international data networks. NIHnet connects LANs using TCP/IP, AppleTalk, and IPX protocols. It provides remote login and high-speed access to the central facilities, fast file transfer, and local and worldwide mail connections.

Users connected to the Internet can access Enterprise Systems services via the TCP/IP protocol. LAN users experiencing problems should first contact their technical LAN coordinator. See Section 5.2.3 for more information on the role of the technical LAN coordinator.

Dialup connections to NIHnet are available using Parachute (PPP & Apple Remote Access Control High-speed User Telecommuting Engine), a CIT-supported product. See Section 6.2.6 for more information.

Domain Name Servers

In TCP/IP-based networking, the name server is the networked computer that translates Internet names, such as tn3270.titan.nih.gov, into the Internet Protocol Address (Internet number or IP number) necessary to make the connection. All connections to CIT TCP/IP-based services should be done through the Internet names, since the numerical IP addresses are subject to change. For example, if a user on the network wants to open a file transfer (FTP) session using FTP to Titan, the person would FTP to FTP.TITAN.NIH.GOV. The name server then translates that address into the Internet number for the actual FTP session.

NIH users can register a hostname, set up an alias, perform DNS lookups, assign additional IP addresses, and perform other basic DNS changes themselves through the Web. Go to:

http://www.net.nih.gov/dns

TCP/IP users at NIH should configure the network options on their desktop workstations to use the name servers in the following order:

	IP Address	Name Server
1	128.231.128.251	ns.nih.gov
2	128.231.64.1	ns2.nih.gov
3	130.14.35.128	lhc.nlm.nih.gov

By having backups for the name servers, TCP/IP network users at NIH can be assured of the most reliable service possible.

6.2.1 OS/390 Telnet Servers

All access to CIT services via TCP/IP should be performed using host names (not the numerical IP addresses). See Section 6.1 for the Internet host names for TCP/IP access to online services. The Domain Name Servers at NIH handle the name-to-address conversion for TCP/IP connections. See Section 6.2 for information on Domain Name Servers.

Use a full-screen (3270) connection to access all Titan services. There must be TN3270 client software installed on the workstation. Make a telnet connection to tn3270.titan.nih.gov in order to logon to Titan's full-screen (3270-type) interactive applications. All system and user-written applications that run under TSO can be reached with TN3270 access. In addition, other DHHS services can be accessed via this connection (see Section 6.2.5).

Users with Internet connections running TCP/IP software on their workstations can access other computers that are connected to the Internet (such as the NCI Cray in Frederick and the NIH Helix Systems). The telnet facilities of TCP/IP allow users to access other Internet computer sites interactively.

The NIH Computer Center supports TCP/IP access to the Enterprise Systems from DOS- and Windows-based personal computers and Macintosh personal computers.

6.2.2 Client Products for TCP/IP Services

In order to access TCP/IP services on a NIHnet-connected workstation, users must install a compatible communications software package on the workstation itself. High-speed file transfer, remote job submission, and 3270 (full-screen) are some of the powerful capabilities currently available using this protocol. While Windows 95, Windows 98, Windows 2000, and Windows NT include TCP/IP driver software, DOS and Windows 3.x users need 3rd party software. NIH Macintosh users have a TCP/IP control panel as part of the Macintosh operating system.

QWS3270 PLUS for TN3270 Connections

The NIH Computer Center has a site license for QWS3270 PLUS, the commercial version of QWS3270, which provides 3270 (full-screen) terminal emulation for PCs running 32-bit

Windows, Windows 9x, or Windows NT. QWS3270 PLUS is fully compatible with the NIH Computer Center's OS/390 systems. This 3270 client software for network connections is available without charge. Titan users can download QWS3270 PLUS from the Web by pointing their browser to:

http://sdp.cit.nih.gov

and select NIH TCP tools. Titan users must enter their USERid and RACF password. Other NIH staff with NIH IP addresses can also download QWS3270 PLUS. Contact TASC if you need assistance.

6.2.3 TCP/IP Connectivity for the Macintosh

In order to use a networking application, such as TN3270, Open Transport must be installed on the Macintosh. Open Transport provides a control panel (TCP/IP) that allows users to configure the Macintosh to their specific networking needs. Open Transport is included with the Mac operating system. Contact TASC for additional information.

A unique IP (Internet) address (number) is needed to configure Open Transport on each individual Macintosh on the network that will be using the TCP/IP protocol. A user can generally acquire the unique IP number by selecting "DHCP Server" in the TCP/IP control panel. An invalid or non-unique IP number can cause problems for the user and for other workstations on the network.

6.2.3.1 TN3270 for the Macintosh

TN3270 allows a Macintosh user, on a LAN connected to NIHnet, to access full-screen Computer Center services, such as the Titan system. This software is available from PUBnet, the collection of network services available through NIHnet. PUBnet, which is maintained by CIT, is available through the World Wide Web at:

http://pubnet.nih.gov

6.2.4 LAN SNA Gateways

Workstations and PCs on a LAN equipped with an SNA gateway can effect SNA 3270-type connections equivalent to connections traditionally achieved via 3270 terminals connected to a cluster controller. The LAN SNA gateway is connected via a telecommunication line (usually a 9600 bps leased line) to the NIH Computer Center. Users connected to the LAN communicate with the gateway using a LAN-based communications protocol. The gateway then converts the information coming in from the workstation to SNA/SDLC and, acting as a cluster controller, sends that information over the line to the mainframe. A single communication line connects the LAN and the NIH Computer Center, eliminating the need for individual dialup modems for each workstation.

CIT strongly recommends the use of TN3270 rather than LAN SNA gateways to access Titan. (See Section 6.2.1.)

6.2.5 Access to Other DHHS Applications

The DIMES (Departmental Information Management Exchange System) VTAM network is a utility that interconnects host computer services offered by the Department of Health and Human Services (DHHS). It provides access to a wide range of dissimilar communications terminals and computers, incorporating support for many different communications protocols and operating environments.

Titan users can access DIMES services, including the NIH OS/390 South System, through the full-screen (TN3270) connection to the Titan Application Selection menu. For further assistance, call TASC.

6.2.6 Parachute

Dialup access to NIHnet is available through Parachute, a service sponsored by CIT. Parachute (PPP & Apple Remote Access Central Highspeed User Telecommuting Engine) allows users to connect remotely, using a modem and a phone line or an ISDN digital phone line, to a central server on the NIH wide-area network (NIHnet). Using Parachute, NIHnet and Internet services such as the Central Email Service, the OS/390 Systems—including Titan, Helix services, and the World Wide Web can be accessed at modem speeds using high-speed remote technologies. To connect to Titan through Parachute access to the NIHnet, you will also need a 3270 (full-screen) terminal emulation software package, such as QWS3270 PLUS installed on your workstation. For information on QWS3270 PLUS, which is supported by CIT, see Section 6.2.2.

To apply for Parachute service a customer must:

- be registered to a CIT account. (If you do not currently have an account—or if you are uncertain whether you have an account or who your account sponsor is—contact TASC.)
- be an NIH employee or contractor
- have a valid business reason for needing this service

As with all other CIT services, an application for Parachute service requires approval of the account sponsor. The sponsor can request Parachute service for a user via Web Sponsor.

For more information about Parachute, go to:

http://parachute.nih.gov

For information on a variety of high-speed remote access technologies, go to:

http://remoteaccess.nih.gov

For further information, send e-mail to tasc@nih.gov, or call TASC.

6.2.7 Other Interactive Access

CIT highly recommends using the TN3270 feature of NIHnet for high-speed network access to 3270-based applications (see Section 6.2.2). However, there are slower dialup options available. Please note that IBM 3270 terminals and compatible devices cannot be ordered through the NIH Computer Center, but must be obtained through standard procurement channels.

If you cannot use TN3270 to access Titan, contact TASC. The help desk will arrange to have a telecommunications specialist contact you.

6.3 TELECOMMUNICATIONS FOR PRINTING OR JOB SUBMISSION

The NIH Computer Center supports both dialup and leased line service for high-speed remote job entry (RJE) telecommunications for printing or job submission. When dialup service is selected, the user must provide the modem at the RJE workstation.

Terminals supported:

- SNA/SDLC JES2 RJE Terminals (pooled access-multiple front-end process)—Titan supports all System Network Architecture/Synchronous Data Link Control (SNA/SDLC) terminals that are compatible with or emulate IBM 3777 (SNA PU Type 2)
- All synchronous JES2 RJE Terminals

Dialup Service: provided through any modem compatible with the V.32 protocol modem (2400-9600 bps).

Leased-Line Service: 4800 bps and 9600 bps

Selection of the correct communication lines and modems for high-speed applications is a complex task and can have a profound effect on the user's costs for teleprocessing services. Users should contact TASC for specific recommendations regarding all high-speed communication service applications.

Access via RJE Emulation and RJE Workstation

Users can access Titan through high-speed RJE workstations under the control of JES2. Personal computers with RJE emulation software, and necessary hardware can also establish a dial connection and operate as a RJE workstation. After establishing a dial connection:

- Enter the communications mode
- Transmit a JES2 sign-on control statement.

The system should immediately respond.

There is an automatic disconnect after a terminal has remained idle (i.e., no data transmitted in either direction) for the following periods of time:

- **Dialup RJE station:** 20 minutes
- **Leased-line RJE station:** 60 minutes

To resume processing after an automatic disconnect has occurred, it will be necessary for the station to reconnect through normal sign-on procedure.

An alternative to the use of RJE terminals for printing output is the VPS printing service (see Section 6.5.4).

For additional information on RJE terminals, see Section 11.1.2.

6.4 FILE TRANSFER AND DATA EXCHANGE

This section describes various methods of transferring data between desktop computers and the OS/390 mainframes and between NIH and other computer centers.

6.4.1 File Transfer Using FTP

A user can transfer files between a workstation connected to the Internet, or on a NIHnet-connected LAN running TCP/IP software, and the Titan system. The FTP facilities of TCP/IP provide high-speed file transfer between a user's workstation and the other Internet site. For FTP access, connect to FTP.TITAN.NIH.GOV, the host name of the FTP server on Titan.

Users with a TCP/IP connection to the Internet can transfer files in either direction (i.e., to the mainframe, or from the mainframe to their workstations). Unix workstations can also transfer files to and from Titan using appropriate FTP software packages.

Contact TASC for recommendations on client products for TCP/IP-based file transfer.

WS_FTP Pro

CIT provides WS_FTP Pro to its users. WS_FTP Pro, a software package based on the file transfer protocol (FTP), provides fast and accurate transfer of files or collections of files between Internet-connected computers using Windows 95/98/2000/NT.

WS_FTP Pro has been customized with pre-configured sessions for the major NIH computer systems. The installation program installs two interfaces—Classic and Explorer. If you connect to Titan, use the Classic interface (the icon labeled WS_FTP Pro). This interface provides the best display of file names and allows you to use the QUOTE and SITE commands.

For security reasons, we recommend that you don't allow WS_FTP Pro to encrypt and store your password in its .ini file.

WS_FTP Pro software can be downloaded from the Web. Go to:

http://sdp.cit.nih.gov

and click on NIH TCP Tools. Titan users must enter their USERid and RACF password. Other NIH staff with NIH IP addresses can also download WS_FTP Pro.

Electronic documentation is included with the software, under the help menu. If you need additional assistance, contact TASC.

6.4.2 Parachute

Parachute allows authorized users to logon to NIHnet and to e-mail from off-campus using a high-speed modem and a standard telephone line. Once you have established the modem connection to the network via Parachute, you can use an FTP software package to transfer files to and from your workstation. For additional information on Parachute, see Section 6.2.6.

6.4.3 Network Job Entry (NJE)

The NIH Computer Center, in cooperation with other data processing centers, provides a capability whereby a batch job can execute at one data center and output can be printed at another. This facility is easy to use and does not require significant JCL changes to implement. NJE (Network Job Entry) files can be transferred between the NIH Computer Center and other computer centers using host-to-host file transfer. This type of file transfer is performed using two batch programs—SENDFILE and RCVFILE.

These programs can perform the file transfer under the following conditions:

- The other site (computer center) must be defined to NIH as a JES2 NJE node; i.e., it must be an OS/390 JES2 or JES3 node, a VM RSCS node, or a VSE POWER node.
- The other site must have the NIH Computer Center-written SENDFILE and RCVFILE programs (or equivalent programs for VM or VSE).
- Users transferring a file must be authorized to use both the sending and receiving site.
- Any job that is submitted from another NJE node or RJE (remote) to run on Titan must have:

  `,USER=$iii` coded on the JOB statement (where "$iii" is the Titan RACFid under which the job will run)

  and

`,PASSWORD=password` coded on the JOB statement (where password is the Titan password for the RACFid under which the job will run)

- In order to view the job in output hold on Titan instead of at the originating site, add a `/*ROUTE PRINT NIHJES2` statement.
- Users who run jobs at other NJE nodes and then route the job to print on Titan must add a `/*JOBPARM ROOM=bbbb` statement after their JOB statement where "bbbb" is the box number where the output is to be placed. If you want this output placed in one of the boxes at the Parklawn site, place the letter "P" in front of the box number.

For more information on SENDFILE and RCVFILE and the sites that support this type of file transfer, refer to the manual *Batch Processing and Utilities at the NIH Computer Center*.

6.4.4 CONNECT:Direct

CONNECT:Direct, a product that provides host-to-host file transfer, is required by the Department of the Treasury for online financial transactions with their systems. The function it provides is similar to that of the SENDFILE and RCVFILE programs (described in the manual *Batch Processing and Utilities at the NIH Computer Center*) but it is easier to use. CONNECT:Direct monitors the progress of the file transfer.

CONNECT:Direct must be installed at the remote site as well as at NIH, and requires either a VTAM or TCP/IP connection between the two sites. CONNECT:Direct is controlled by a process that is similar to a JCL procedure. Once the process is written, the user needs only to supply the values for various parameters. The two parameters used most are the source data set name and the target data set name.

CONNECT:Direct requires coordination with another site as well as modifications to certain CONNECT:Direct configuration files. To register to use CONNECT:Direct, submit an SRT that includes the following information:

- the destination of the data to be transmitted
- the nature of the data to be transmitted
- the amount and frequency of the transmitted data

Each project must have a Data Transmission Administrator (DTA) who is responsible for setting up and maintaining the jobs and CONNECT:Direct processes needed to transmit the data. All correspondence with CIT regarding a registered CONNECT:Direct project should specify the name of the DTA.

If users on other systems will be transferring files to Titan via CONNECT:Direct, the DTA must obtain a restrictive Titan USERid for each such user. This USERid will have the following special characteristics:

- logon to NIH systems will not be permitted
- the associated password will not expire

Users from other systems must add the following CONNECT:Direct parameter to the appropriate CONNECT:Direct control statements:

```
SNODEID=(userid,password)
```

The DTA must arrange that an appropriate RACF profile be set up and that this restricted USERid has access to it. The DTA should contact the security coordinator for the account.

For additional information, refer to *Batch Processing and Utilities at the NIH Computer Center* or
http://silk.nih.gov/public/PUBLIC.@WWW.TITAN.NORTH.DATA.TRANSFER.HTML

6.4.5 IND$FILE for 3270 File Transfer

Many PC 3270 emulation packages support file transfer between the host and the PC if an IBM program named IND$FILE is installed on the host. IND$FILE provides the mainframe side of a file transfer capability from 3270-type terminals (or PCs emulating them). IND$FILE has been successfully tested with such packages as QWS3270 PLUS, the IBM PC 3270 Emulation Program, EXTRA by Attachmate, and IRMAremote for Hayes AutoSync by DCA.

The use of IND$FILE for 3270 file transfer requires specific software on the PC. Because the use of IND$FILE in most 3270 emulation packages is transparent to the user, it is not necessary to know how to use it, only that it is available. Perform the file transfer from the TSO ready prompt or from the command option of the CIT/Titan Primary Option Panel.

6.4.6 Exchanging Tapes with Other Installations

Tape is the preferred medium for transporting large data files from one installation to another because RAMAC (logical 3390) disks cannot be transferred. Whether exporting or importing data, it is very important to ensure that the receiving installation has the type of drive capable of processing the tape, especially cartridge tapes. Users can refer to *Batch Processing and Utilities at the NIH Computer Center*.

Tapes in the Virtual Storage Manager (VSM) may not be removed from the NIH Computer Center. If you need to check out a tape that has a serial number above 500000 (this includes all VSM tapes), you must first copy it to a standard 3480 tape cartridge for removal. Users may provide their own 3480 tapes or purchase them from CIT.

6.5 NETWORK SERVICES

Network connectivity has become an essential tool for the biomedical, clinical, and administrative communities at NIH, other government agencies, and organizations worldwide. NIHnet is the high-speed network backbone that interconnects NIH LANs, the NIH Computer Center's central servers, and international data networks. NIHnet, supported by CIT, supports the TCP/IP, AppleTalk, and IPX communications protocols.

See Section 6.1 for the Internet host names for NIHnet access to the central systems. Section 6.2 contains the Internet Numbers (numerical IP addresses) for the NIH domain name servers. These numbers are required for configuring network software packages.

CIT supports Parachute, a service that offers high-speed dialup connectivity to access NIHnet. See Section 6.2.6 for more information on Parachute.

6.5.1 NIHNET CONNECTIVITY

A NIHnet connection provides reliable, high-speed access to a wide variety of network services. Users with personal computers and workstations can use a TCP/IP connection to the Internet to perform high-speed file transfers (FTP), submit batch jobs, take advantage of client/server database management systems, send e-mail worldwide, transmit files to the high-speed mainframe printers, and initiate full-screen sessions (via TN3270) to Titan. See Section 6.2 for information on network access to Computer Center services, Section 6.4 for transferring files over the network, and Section 7.9 for Titan e-mail services.

Users with NIHnet-connected desktop computers can back up their data to the OS/390 System using the NIH Backup and Recovery Service (NBARS) using TSM (Tivoli Storage Manager) client software. See Section 10.3 for information.

NIHnet is the NIH wide area network (WAN). It provides high-speed electronic communications among a multitude of local area networks (LANs) in every Institute and Center (IC) of the NIH biomedical, clinical, and administrative communities. NIHnet is the data highway over which images, data, and electronic mail all travel. The Ethernet network standard predominates at NIH and CIT recommends its use.

NIHnet connects the main campus to LANs in NIH buildings throughout the Washington D.C. area, Baltimore, North Carolina, and as far away as Arizona. The majority of computers connected to NIHnet via the LANs are desktop computers, such as personal computers (PCs,) Macintoshes, and Unix workstations.

The topology of the NIHnet backbone uses redundant connections and equipment locations to provide more resilience and resistance to outage. To ensure sufficient capacity for data requirements, the NIHnet has a high-speed primary connection to the Internet. Other agencies that use the NIH Computer Center can also request a connection to NIHnet. A portion of NIHnet resides in the machine room of building 12, including the electronic mail gateway, the Internet connections, and gateways to other networks in DHHS.

For every LAN connected to NIHnet there is a technical LAN coordinator (TLC). Users on a LAN connected to NIHnet who have connectivity problems should first contact their TLC for assistance. The TLC works with CIT in the event of a networking or connectivity problem between a LAN and its NIHnet connection. For additional information on technical LAN coordinators, see Section 5.2.3.

CIT supports the NIHnet infrastructure or backbone and bills each IC. A smaller part of the installation and support of this backbone is funded by the NIH Management Fund.

CIT organizations support a variety of NIHnet-based services including:

- Central Email Service (CES)—provides e-mail services for the NIH community. The CES provides e-mail, scheduling, and other messaging services to the NIH. NIH users are encouraged to take advantage of this service. There is no direct charge for this service to NIH ICs. More information can be found at http://www.mail.nih.gov.
- Domain Name Service—the Domain Name Servers (DNS) are networked computers that translate Internet names, such as TN3270.TITAN.NIH.GOV, into the IP addresses necessary to make the connection. NIH users can register hostnames and make other DNS changes via the Web. See Section 6.2 for more information.
- FAXSERV—a fax transmittal system that allows users to send faxes directly from the network. FAXSERV is available to all e-mail users on NIHnet.
- Listserv facility—supports online groups via e-mail and the Web. See Figure 6-2.
- NetNews Service—news.nih.gov is available to all NIH users for reading and posting Usenet news. To access newsgroups, you need news reader software.
- NIH Backup and Recovery Service (NBARS)—allows NIHnet-connected users to back up and recover data stored on LAN servers and desktop computers. See Section 10.3.
- NIH Directory and E-mail Forwarding Service—e-mail directory for NIH (http://directory.nih.gov).
- NIH DSL (Digital Subscriber Line) Program—high-speed remote telephone access to the NIH network (http://remoteaccess.nih.gov/dsl.htm).
- NIHnet IP Multicast services—videocasting to the desktop (http://videocast.nih.gov).
- NIHnet Mail Gateway System—a set of gateways allowing the exchange of electronic mail between the different systems supported at NIH. See Section 6.5.3.
- Parachute (PPP & Apple Remote Access Central Highspeed User Telecommuting Engine)—a service supported by CIT that offers high-speed dialup connectivity to access NIHnet. See Section 6.2.6 for more information on Parachute.
- PrintShare—a service developed and supported by CIT that allows networked PC, Unix, and OS/390 System users to print to the nearest networked AppleTalk printer.
- PUBnet—a collection of network services available via the NIHnet. PUBnet provides software distribution (freeware, shareware, NIH site-licensed software) for MacOS users,

security/virus information for both the Windows and Macintosh platforms, and NIH-approved electronic forms available for download (http://pubnet.nih.gov).

- SDP—(Software Distribution Project) distributes licensed software to the NIH Community and participating DHHS agencies (http://sdp.cit.nih.gov).
- Windows Internet Name Service (WINS)—provides a way to get NetBIOS name lookup for Windows computers on a network.

In addition, there are NIH-supported services and general Internet services. The variety of NIHnet-based services reflects the heterogeneous nature of the NIH environment, and of the Internet as well. Despite their variety, however, these network services have one thing in common: NIHnet is the conduit by which they are delivered to users at NIH. (In addition, most are also TCP/IP-based.) For more information on specific NIHnet-supported services, contact TASC or go to:

http://www.net.nih.gov

6.5.2 INTERNET

The Internet is the most extensive high-speed network in the world encompassing millions of users at hosts worldwide, all of which transfer information using TCP/IP protocols. The Internet is used heavily by research scientists to exchange papers, data, and information relating to ongoing research and other topics of interest.

Each member of the Internet is assigned a unique host name. See Section 6.2 for the Internet host names used by the NIH Computer Center.

The TCP/IP protocols used on the Internet are used by most NIHnet-connected LANs. With the appropriate software, NIH research investigators and administrators on TCP/IP-based NIHnet-connected LANs can access worldwide Internet services such as information browsing, file transfer (ftp), remote login (telnet), e-mail, directory services, and network news.

World Wide Web

One of the most popular services of the Internet is the World Wide Web, which provides access to a multimedia collection (text, images, video, and sound) of hyper-linked documents. Users with a TCP/IP connection and browser software (such as Netscape Navigator or Microsoft Explorer) on their workstations can access the World Wide Web. Users on the Helix System can also access the World Wide Web through Lynx, a non-graphical Web browser. A Uniform Resource Locator (URL) describes where an Internet object, such as a document or a "Homepage," is located and what protocol is needed to access it.

Many CIT and NIH Computer Center facilities now take advantage of the Web. The Web will serve as the "front end" to more and more applications in the future. All users of the NIH Computer Center should have browser software on their desktop computers in order to: download software, learn the identity of their TLCs, read documentation (including

Interface), order manuals, look up an e-mail address, register for a training course, submit an OS/390 Service Request Ticket, use RACF, change account information (for account sponsors), and learn about-or take advantage of many other CIT services.

SILK (Secure Internet LinKed) Web technologies, supported by the NIH Computer Center, allow users to access OS/390 data and many NIH Computer Center services through the Web. For information on SILK see Section 7.5 or visit:

http://titan.nih.gov

See Figure 6-2 for a directory of World Wide Web sites that may helpful to Enterprise System users.

Figure 6-2 World Wide Web Service Directory

Service	World Wide Web Address
National Institutes of Health	http://www.nih.gov
Antivirus Web site	http://antivirus.nih.gov
NIH Electronic Directory	http://nedinfo.nih.gov
NIH Data Warehouse	http://datatown.nih.gov
Software Distribution Project	http://sdp.cit.nih.gov
Center for Information Technology	http://cit.nih.gov
Computational Bioscience	
Molecular Modeling	http://cmm.info.nih.gov/modeling
NIH Computer Center Systems	http://datacenter.cit.nih.gov
ALW	http://www.alw.nih.gov
Helix	http://helix.nih.gov
NIH Biowulf Cluster	http://biowulf.nih.gov/
Enterprise Systems	http://datacenter.cit.nih.gov/enterprise.html
OS/390 Titan	http://titan.nih.gov
Transition Update	http://silk.nih.gov/silk/titan
Titan Web Sponsor	http://websponsor.cit.nih.gov
OS/390 South System	http://datacenter.cit.nih.gov/mvs
Database Technologies	http://silk.nih.gov/dbtech
Problem Reporting	http://datacenter.cit.nih.gov/srt
RACF	http://silk.nih.gov/racf
SILK Web	http://silk.nih.gov
Web Sponsor	http://silk.nih.gov/sponsor/homepage
Enterprise Open Systems (EOS)	http://datacenter.cit.nih.gov/eos
Windows/NT Application Servers	http://datacenter.cit.nih.gov/nt
NIH Backup and Recovery Service	http://silk.nih.gov/silk/nbars
Oracle License Information	http://silk.nih.gov/silk/oracle
Oracle Database Servers	http://silk.nih.gov/silk/citoracle
Customer Services	
Accounts	http://support.cit.nih.gov/accounts
Computer Training	http://training.cit.nih.gov
Publications	http://publications.cit.nih.gov
TASC	http://dcs.cit.nih.gov/tasc/tasc.htm
Network Services	
Listserv	http://list.nih.gov
NIHnet	http://www.net.nih.gov
Parachute	http://parachute.nih.gov

6.5.3 NIHNET MAIL GATEWAY

The NIHnet Mail Gateway System is a set of gateways that allows the exchange of electronic mail among users of all mail systems supported at NIH and between NIH users and other users on the Internet. The NIH mail systems include: the Central Email Service (CES), the OS/390 South System's ENTER MAIL, and Helix mail systems. Note: not all NIH mail systems support the exchange of attachments.

6.5.4 VPS Printing Service

The VPS printing service supports mainframe-to-network printing from the OS/390 mainframes to local NIHnet-connected printers. Printed output from Titan can be produced on printers attached to a PC, workstation, or local area network (LAN) connected to NIHnet and running an LPD server.

Local printers (print queues) that have not been used for six months will be removed from the table of queue names and flagged for reissue. Contact TASC if there are any questions concerning this policy.

AppleTalk printers are also supported in conjunction with the PrintShare services provided by CIT (see below).

VPS converts OS/390 print output into a TCP/IP print request conforming to the Berkeley Line Print Daemon (LPR/LPD) standard. This LPR print request is then sent from Titan to the appropriate networked LPD server. Many users can share a printer, or one printer can be used exclusively by one user.

The LPD server must be configured locally and registered with CIT prior to being used by VPS. Users are responsible for setting up the local LPD server. An IBM PC-compatible environment requires at least Windows 3.1, Windows 95/98, or NT. You can also run LPD from the command line in DOS; however, this dedicates the PC to only running the LPD server. Almost any Unix LPD server can be used.

CIT will assist administrators in modifying configurations for VPS printing from Titan. Firewalls must be properly configured to permit VPS to deliver print requests from the Titan system to LAN printers.

Additional Information

- The form required to register your LPD printer for VPS is available from the Web at:

  http://silk.nih.gov/silk/vps

Macintosh Printing Using PrintShare
PrintShare, a NIHnet service developed and supported by CIT, allows networked PC, Unix, and OS/390 users to print to the nearest networked AppleTalk printer. A computer that can send LPR print requests can send those requests to a networked AppleTalk-capable printer (such as an Apple LaserWriter or a HP LaserJet) using PrintShare.

PrintShare can be used with VPS to send OS/390 mainframe print jobs, directly to a networked AppleTalk printer. For further information, or to register an AppleTalk printer for PrintShare, call TASC or visit:

http://silk.nih.gov/silk/vps

6.5.5 Mainframe Printing Using TCP/IP

Workstations connected to NIHnet or the Internet can transmit files via TCP/IP for printing on the OS/390 mainframe printers by way of SITE SUBMIT.

SITE SUBMIT
The NIH OS/390 FTP Server's SITE SUBMIT command can be used to print files on the high-speed laser printers at the NIH central facility

Once the SITE SUBMIT command is issued, simply transfer the file using the usual PUT or SEND command (if you must supply a name for the file on the remote host, don't worry, it will be ignored). The file will be printed on the high-speed laser printers at the central facility and will be placed in the output box indicated in the JCL.

JCL example:

```
//JOBNAME JOB USER=$III,PASSWORD=PPPPPPPP
// EXEC COPY
//OUT1     OUTPUT CHARS=CR10,FORMS=900,FORMDEF=PS00,
//         PAGEDEF=1108,COPIES=2
//SYSUT1   DD
  (your text goes here)
//SYSUT2   DD  SYSOUT=*,OUTPUT=(*.OUT1)
```

This example prints 2 copies of the data set on the 900P cut sheet forms using the CR10 character set.

All JCL must be in upper case. The first three lines in the example above are required. If they are not there, the job will be flushed from the system prior to printing.

After making the appropriate changes to the data set, the file must be uploaded to the print queue on the OS/390 System. This is accomplished by using the FTP client on the local host to connect to the NIH OS/390 FTP Server. Once logged in, send the QUOTE SITE SUBMIT command to the FTP Server to tell it that the next file to be transferred should be submitted

as a batch job. (On some systems, SERVER SITE SUBMIT is implemented on the local client FTP instead of QUOTE SITE SUBMIT.)

Once the SITE SUBMIT command is issued, simply transfer the file using the usual PUT or SEND command (if you must supply a name for the file on the remote host, don't worry, it will be ignored). The file will be printed on the high-speed laser printers at the central facility.

7 SYSTEMS AND APPLICATIONS SOFTWARE

A wide range of major systems and development facilities are available on Titan for its users. This includes terminal systems, database systems, client/server products, World Wide Web facilities, and programming languages. See Figure 5-1 for a list of supported software facilities.

7.1 OPERATING SYSTEMS

An operating system is a library of programs that controls resource allocation and program execution. These programs can be tailored to meet the individual requirements of a computer installation. The NIH Computer Center Enterprise Systems offer the System 390 computing platform, open systems (Unix-based), and Windows NT/2000-based services.

7.1.1 OS/390 (MVS) System

The systems software serving the OS/390 Titan facility is composed of the IBM MVS/ESA (Multiple Virtual Storage/Enterprise System Architecture Operating System) with job control language (JCL) and the Job Entry Subsystem Version 2 (JES2) as the user interface. For more information on job control language, refer to *Batch Processing and Utilities at the NIH Computer Center*.

The OS/390 operating system vastly expands the address space that can be available to each task and uses the computer's memory more efficiently than non-virtual systems. This is possible since only the active portions of programs are kept in real memory. JES2 acts as the batch job scheduler and controller for the OS/390 operating system. OS/390 allows the creation of multiple, data only address spaces (called "data spaces") of up to 2 billion bytes of virtual storage. OS/390 substantially enhances the reliability, availability, and serviceability characteristics of the operating system.

This complex operating system presents a unified system interface to the user. Shared files and work queues make it possible to balance the workloads of the various subsystems and to permit service to resume promptly even if one machine is out of service for an extended period of time. This is done by switching the services usually provided by the failing machine to the others.

The OS/390 system is a standardized environment that offers users flexibility in the establishment and utilization of TSO sessions. Language environment (LE) is an architectural interface designed to meet IEEE's portable operating system interface (POSIX) standards. By meeting these POSIX standards for code and user interfaces, LE-conforming programs can cross operating systems, platforms and environments. The LE interface provides application programs with a common run-time service and run-time environment—that is, a set of resources and modules that support the execution of an application program. LE establishes a common run-time environment for all participating high-level languages (HLL).

7.1.1.1 Cross-System Enqueue

The cross-system enqueue software in use at the NIH Computer Center is MIM (Multi-Image Manager) from Computer Associates. It provides automatic data set integrity protection in a multi-processor environment, preventing accidental destruction of data from jobs or terminal sessions modifying any data set with the same name at the same time.

Jobs that require access to a data set that is being referenced in a manner that allows it to be created or updated will be suspended until the controlling job or session relinquishes control. Since the cross-system enqueue software does not check for volume information, access to all data sets with the same dsname will also be suspended. Because the suspension of job execution ties up system resources and consequently degrades the system throughput, jobs in suspension for over 30 minutes are canceled automatically. This problem can be avoided by using the /*CNTL, /*AFTER, and /*BEFORE facilities that keep the jobs awaiting execution rather than suspending job execution after it has already begun. For details on avoiding data set contention problems, refer to the manual *Batch Processing and Utilities at the NIH Computer Center*.

7.1.1.2 Software Features Not Permitted at NIH

System libraries and software modules will not be updated or changed to accommodate user software. Also, user software is not permitted to use any means (e.g., CALL, ATTACH, LINK) to invoke compilers, system modules, or the Program Management Binder unless Computer Center documentation specifically permits such access. These restrictions are necessary to preserve the integrity and dependability of the operating system.

The creation of unmovable data sets on disk is not permitted.

The following facilities incorporated in the OS/390 operating system cannot be used at the NIH Computer Center because they are not supported or their use may cause performance problems:

Checkpoint/Restart
MVS Password Protection
Absolute Track Allocation
Reserve/Release Macros
WTO/WTOR Macros
APF Facilities[6]
SSCT[6]
Special SVCs[6]
Special SMF Exits

[6] Contact the NIH Computer Center through TASC concerning the use of these facilities.

RACF ERASE option of ADDSD and ALTDSD
ERASE option of any AMS command
SUPER ZAP[7]

No list of exceptions can be complete. The *Titan User's Guide* documents the software facilities to be used at the NIH Computer Center. Occasionally a user will discover a non-supported feature in a Computer Center supported product that works or appears to work, and will integrate it into an application. Such a user runs the risk that the non-supported feature will suddenly not work at all, or worse yet will appear to work but will actually produce erroneous results. Before using a facility not mentioned in Computer Center documentation, submit an OS/390 Service Request Ticket (see Section 5.2.2) to make certain it is allowed. In many cases an alternative technique is supported.

It is forbidden to have software send information about the application to the machine room operator's console.

Under no circumstances should a user access system data sets (e.g., system libraries, disk VTOCs) with any software other than that supplied by the NIH Computer Center and described in the manual *Batch Processing and Utilities at the NIH Computer Center*. Formal action will be taken against anyone who attempts to circumvent protection software and threatens the security of accounts or data.

It is against Computer Center policy to permit use of the system as a recreational facility; CIT will take immediate action against anyone found using its resources to play computer games, even in learning situations. For further details on restrictions against use of computers for personal and recreational use, see Section 1.5.

Because the printed output format of Computer Center utilities is subject to change without notice, software should not be designed to depend on such output. For information on utility restrictions, refer to the manual *Batch Processing and Utilities at the NIH Computer Center*.

Consult Section 9.4 for a summary of the job control language features that cannot be used at this computer center.

7.1.2 Other CIT Enterprise Systems

The open systems components of the NIH Computer Center Enterprise Systems include the Enterprise Open Systems (EOS), a Unix-based computing environment, and the Unix System Services (USS) subsystem of the OS/390 operating system.

[7] Contact the NIH Computer Center through TASC concerning the use of these facilities.

7.1.2.1 Unix System Services (USS)

The Unix System Services (USS) component of the OS/390 System offers significant enhancements in the open systems arena. USS includes the POSIX programming environment.

7.1.2.2 Unix (Tru64 UNIX)

The NIH Computer Center hosts a variety of production and development applications on the Enterprise Open Systems (EOS). Compaq/Digital AlphaServers provide the base for the EOS environment for client/server (i.e., Unix-based) applications. For additional information, send e-mail to silkweb@list.nih.gov or visit:

http://datacenter.cit.nih.gov/eos

7.1.2.3 Windows NT/2000 Application Servers

Windows NT and Windows 2000-based applications can be hosted on CIT Intel-based servers that are maintained and monitored on a 7 x 24 basis. This facility provides a computing environment suitable for critical, enterprise-wide applications. For more information, visit:

http://datacenter.cit.nih.gov/nt

7.2 TERMINAL SYSTEMS

Interactive systems communicate with the user through a variety of terminals, prompt the user for input data and instructions, pass data and specifications to programs, and return output to the user's terminal. The interactive database systems are described in Section 7.3. Access these systems through the Application Selection menu.

7.2.1 TSO

TSO (Time Sharing Option) allows the user conversational access to the facilities of the computer system. Data may be entered, retrieved, updated, and stored. Programs may be created, tested, and executed with the results available at a remote terminal.

All data files to be accessed interactively must be OS/390 data sets with standard data set names (See Section 10) and must be stored on disk. Tape data sets must be transferred to disk prior to processing.

TSO commands and subcommands are easy to use. They consist of English words, usually verbs, which describe the work to be done. A HELP command will display the format and operands of any TSO command. There is also a Remote Job Entry (RJE) facility for submitting batch jobs to JES2.

TSO/E LOGON Panel
Access the Application Selection menu using a network or dialup connection (see Section 6) and type NIHTSO. You will be prompted to enter your USERid. Next, you will see the logon panel below:

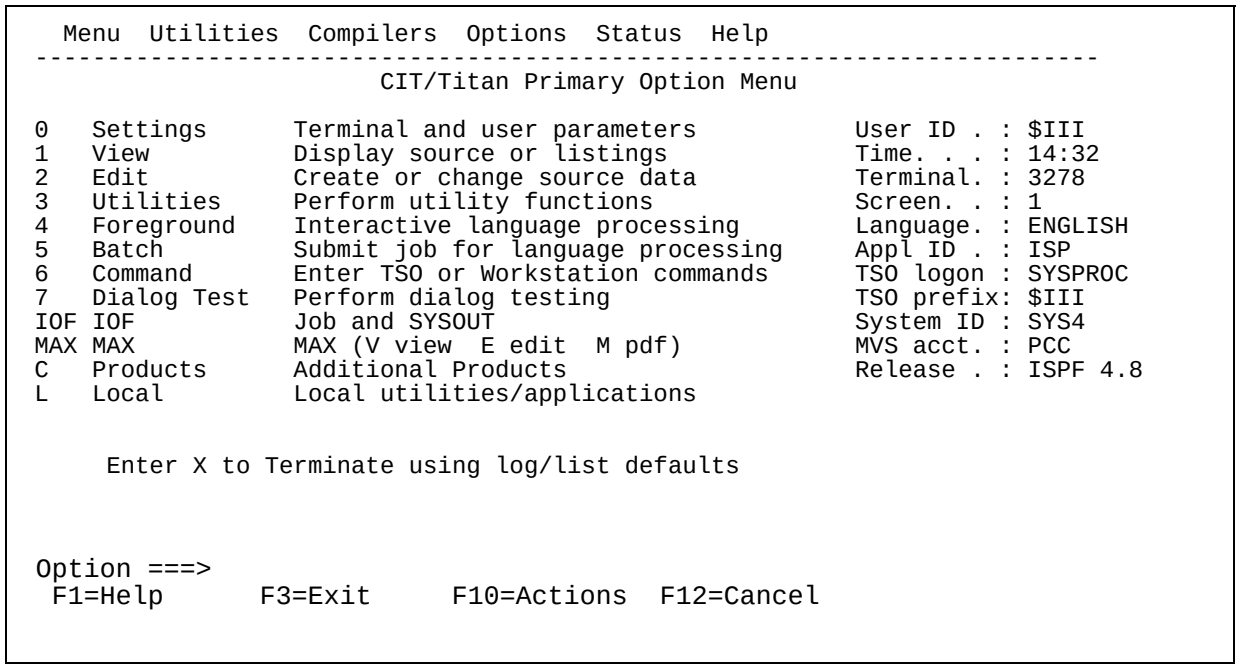
```
 ------------------------------ TSO/E LOGON ------------------------------

      Enter LOGON parameters below:                   RACF LOGON parameters:

          Userid    ===> $III

          Password  ===>                                  New Password ===>

          Procedure ===> MAIN                             Group Ident  ===>

          Acct Nmbr ===> PCC

          Size      ===> 4096

          Perform   ===>

          Command   ===>

      Enter an 'S' before each option desired below:
               -Nomail         -Nonotice        -Reconnect        -OIDcard

PF1/PF13 ==> Help    PF3/PF15 ==> Logoff    PA1 ==> Attention    PA2 ==> Reshow
You may request specific help information by entering a '?' in any entry field
```

Respond by entering your password.

Tips on This Panel

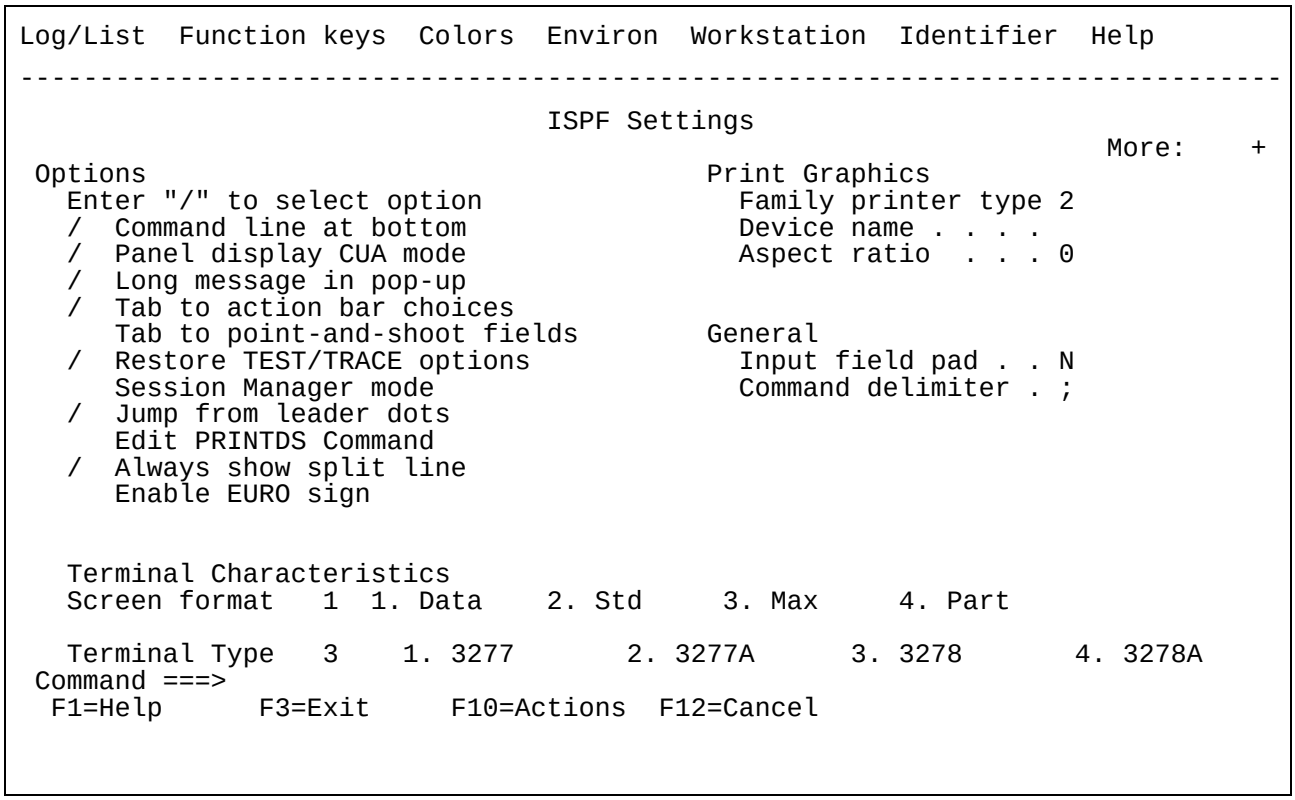
- To change your password—enter a password in the NEW PASSWORD field at any time.
- To change the "Procedure" from the default—change the procedure field by typing the existing one.
- Most other features in this screen have no functionality at this time or have preset values that are not changeable at this time.

CIT/Titan Primary Option Menu
Upon completion of the logon screen you are immediately placed into the message screen, which contains pertinent RACF information and any messages from the broadcast system. Hitting Enter at this time will take you into the CIT/Titan Primary Option Menu panel. To eliminate the copyright panel in the lower left corner and see the full panel for this screen, hit Enter . You can enter the desired option in the option field and proceed into the selected panel. **Note:** the option line is at the bottom of the panel.



Tips on This Panel

- To return the Option ===> to the top of the screen—change the default parameter in the Settings list. Place a zero in the option field and the following screen will appear:



Tips on This Panel

- To return the command line to the top of the screen, remove the / in the "Command line at the bottom" (the default). Simply select the / and hit delete.
- To change the "Tab to action bar choices" setting, remove the / from the "Tab to action bar choices." The default is presently set to place the cursor at the action bar. To get to the option field, you would have to tab down and the default for the "Home" key would be to the action bar instead of the option field.
- Having reset the options, your ISPF main menu will look like the one below for all future sessions.

```
 Menu  Utilities  Compilers  Options  Status  Help
--------------------------------------------------------------------------------
                        CIT/Titan Primary Option Menu
Option ===>

0   Settings      Terminal and user parameters          User ID . : $III
1   View          Display source or listings            Time. . . : 10:45
2   Edit          Create or change source data          Terminal. : 3278
3   Utilities     Perform utility functions             Screen. . : 1
4   Foreground    Interactive language processing       Language. : ENGLISH
5   Batch         Submit job for language processing    Appl ID . : ISP
6   Command       Enter TSO or Workstation commands     TSO logon : SYSPROC
7   Dialog Test   Perform dialog testing                TSO prefix: $III
IOF IOF           Job and SYSOUT                        System ID : SYS4
MAX MAX           MAX (V view  E edit  M pdf)           MVS acct. : PCC
C   Products      Additional Products                   Release . : ISPF 4.8
L   Local         Local utilities/applications

     Enter X to Terminate using log/list defaults


 F1=Help      F3=Exit     F10=Actions  F12=Cancel
```

PF Key Values
The OS/390 version of ISPF also has an impact on the PF key values. In the above panel display, F12 is set to cancel your session.

You should review the PF key settings established by the software and reset them to meet your needs. Please also note that since the PF key settings are not necessarily consistent from panel to panel, we recommend a review of the keys for panels you use with some frequency. Users who have customized PF keys to their own personal features will also have to reset them from the defaults established for OS/390. The command keys should be entered at each panel to verify your default settings.

TSO Edit
The EDIT command of TSO (Time Sharing Option) has two modes of operation: input mode for entering data and edit mode for entering edit subcommands. In input mode lines of data are entered unnumbered or numbered automatically to meet the requirements of various programming languages. In the edit mode, existing data sets are edited using subcommands that provide the following facilities:

- inserting, changing, or deleting lines anywhere in the data set, duplicating lines, and copying or moving lines from one place to another
- adding or deleting line numbers, or renumbering previously numbered data sets that have been extensively changed
- creating new data sets by entering new data or copying data from other data sets

Refer to the TSO documentation for detailed information on simple line-mode editing.

TSO Superset Utilities
Titan provides the TSO user with special utilities that can be used to perform frequently required functions. The commands include: COPY, MERGE, LIST, FORMAT, and LISTJES. SORT functions interactively and prompts the user for input, output, and sort statements if none are provided. The sort will make all allocations. LISTJES is an alternative to the TSO OUTPUT command; it provides scrolling commands for viewing the output.

For additional information about TSO, refer the TSO documentation available from CIT (see Section 5.4).

Web Access
Many TSO commands can be executed through the Web. Open your browser to:

http://titan.nih.gov/tsocmd

Select the command you wish to execute from the drop-down menu, and then type in the name of the job or the data set name. For more information on SILK, see Section 7.5.

7.2.1.1 ISPF (Interactive System Productivity Facility)

ISPF, a software system available under TSO, extends the capabilities of TSO and provides increased performance. ISPF requires the use of a full-screen (3270) connection. CIT recommends a network telnet connection to TN3270.TITAN.NIH.GOV. (See Section 6 for connectivity information.) ISPF consists of two major components: a dialog manager and the Program Development Facility (PDF), also known as SPF. The dialog manager is used to develop formatted screens tailored to the user application. The program development component includes:

- full screen editing commands
- forward, backward, and lateral scrolling
- an interface to data utilities for library, file and data set maintenance
- foreground and background execution of language processors
- a facility for submitting batch jobs to JES2 for background processing
- an online tutorial
- split screen capabilities that permit the user to alternate between two functions as though two terminals were in use

The program development facilities are used to create or access a partitioned or sequential data set. In addition to program source statements and JCL, the data sets may consist of input data or text for any kind of processing or formatting program.

ISPF Logon and Logoff Procedures
To use ISPF, logon to TSO. The system will automatically bring up the CIT/Titan Primary Option Menu. This is the primary option menu for ISPF. To exit ISPF and get to the READY prompt, type **X** at the command line. The LOGON command must be preceded by the proper terminal dialup and system selection procedures as specified in Section 6.1.

ISPF Edit
ISPF provides a complete range of full-screen editing facilities including:

- scrolling forward, backward, or sideways through a data set and use of the cursor to add, change, or delete characters anywhere on the display screen
- inserting, changing, or deleting lines anywhere in the data set, duplicating lines, and copying or moving lines from one place to another
- creating new data sets by entering new data or copying data from other data sets
- performing frequently used operations by use of Program Function (PF) Keys

ISPF Utilities
The Interactive System Productivity Facility (ISPF) utilities are a group of full-screen, interactive commands that provide a variety of functions commonly required for effective processing. These commands are initiated and controlled during an ISPF session through easy-to-use menu selection panels. The major functions are:

- maintaining libraries, data sets, and catalogs
- moving and copying data
- resetting ISPF library statistics
- initiating hard-copy output
- displaying or printing VTOC entries for a disk volume
- browsing through and printing held SYSOUT data

To learn more about ISPF facilities, try using the interactive tutorial. From the CIT/Titan Primary Option menu, select Help from the Action Bar on the top of the panel, and then choose Tutorial.

For additional information on ISPF, consult the documentation offered by CIT. See Section 5.4 for more information.

7.2.1.2 MAX
MAX is a collection of data and file manipulation programmer tools for use under ISPF. MAX has the ability to browse and edit VSAM data sets and sequential data sets online. MAX permits formatted browsing and editing using COBOL copybooks. In addition, MAX

helps users allocate or delete VSAM files. It eliminates ISPF's record length and file size restrictions. Other features include enhanced data set name lists, and a "cut and paste" option for records within one edit session or between edit sessions.

7.2.1.3 MVS/QuickRef

MVS/QuickRef is a pop-up reference tool running under ISPF that allows users to look up information (e.g., on error messages, ABEND (Abnormal ENDing) codes, command structure) and get answers quickly online. The term "pop-up" in this context refers to MVS/QuickRef's ability to "pop up" over the current application and display information rapidly, no matter which ISPF application or panel is active.

To access MVS/QuickRef type QW directly at the ISPF command line or type C for Products from the CIT/Titan Primary Option Menu.

7.2.2 CICS (Customer Information Control System)

CICS is a general-purpose database/data communications system that supports a variety of terminal types and functions as an interactive interface between the user and the application program. CICS provides all required communication functions. The system can support many concurrent users and a diverse group of database files.

CICS functions only with commercial software designed to use CICS as its communications interface. Applications requiring the use of CICS are subject to the prior approval of CIT. The protocols for accessing the user's application will be developed jointly by the user and CIT. For additional information, contact TASC.

7.2.3 ACS WYLBUR

ACS WYLBUR is a high-level, commercial, online software system with features that simplify many data processing tasks. Using English language commands, ACS WYLBUR offers powerful interactive text or data editing and online processing control for program development or production program processing.

ACS WYLBUR allows the user conversational access to the facilities of the computer system. Users can enter, retrieve, updated, and store data. Programs may be created, tested, and executed with the results available at a dummy remote "RMT99" for viewing with the fetch command.

All data files to be accessed interactively must be OS data sets with standard data set names (see Section 10) and must be stored on disk. Tape data sets must be transferred to disk prior to interactive processing.

The commands are designed to be easy to use. They are common English words, usually verbs, which describe the work to be done. The JES2 interface provides a remote job entry

and remote job output (RJE/RJO) facility for submitting batch jobs, monitoring their job status, and manipulating by canceling, purging, or printing the jobs' input and output.

7.3 DATABASE SYSTEMS

This section describes the database systems supported by the OS/390 Titan system of the NIH Computer Center. For more information on relational database facilities supported at the Computer Center, connect to:

http://silk.nih.gov/silk/datacenter/database.htm

See Section 5.2.4 for information on database assistance.

7.3.1 ADABAS

ADABAS is a database management system in which the relationships between data items are stored separately from the physical data. It provides users with the ability to alter how the data is perceived for different applications. It also permits changing data relationships dynamically without requiring that the data format be altered or existing programs changed. An ADABAS database may evolve in scope and complexity without redesign or reprogramming existing applications. This adaptability greatly reduces maintenance activities in a situation of changing requirements.

The access structure used by ADABAS to address physical data is contained in a separate data set known as the Associator. The Associator consists of inverted lists that are maintained for all fields designated as descriptors and the Address Converter which points to the actual data that resides in a separate data set.

ADABAS supports sophisticated data modeling. Users may create simple flat record structures as used in the relational model, or they may create records that contain repeating fields or repeating groups of fields. ADABAS automatically compresses data to minimize disk consumption. ADABAS also supports a general network model with multiple files containing bi-directional, many-to-many relationships between records. Such relationships are based on fields that exist in various files.

Additionally, ADABAS permits the traditional hierarchical model in which multiple files contain bi-directional one-to-many relationships between records. These relationships are also based on fields that exist in the various files.

ADABAS has its own 4GL high-level language (NATURAL). It also provides an interface to standard programming languages. Access to ADABAS may be either online or batch mode. Users desiring to either establish a new or change an existing data file definition within ADABAS should contact TASC.

For additional information on ADABAS, go to:

http://titan.nih.gov

and select ADABAS News.

7.3.2 Model 204

Model 204 is a database management system in which access structures, programs, and data are stored together. Model 204 provides a high degree of flexibility that encourages the use of application prototyping. This reduces the likelihood of structural changes to an application after it has become operational.

Every Model 204 file is a separate data set that consists of five tables. These tables contain directories of field names and attributes, data, inverted lists, and other control information.

Model 204 relationships are based solely on the value of data. Relating two or more records requires the existence of common data values within the records. Hierarchical and network relationships can be supported by this "commonality of data" characteristic.

Model 204 has its own easy-to-learn user language. It also provides interfaces to standard programming languages. Model 204 can be run in batch mode as well as interactively.

Logging on to Model 204
Refer to Section 6 for general access information. To access Model 204 on the NIH Computer Center's OS/390 Titan system, users must have a valid Titan system USERid and password. Account sponsors can register users on their account for Model 204 using Web Sponsor (see Section 2.3). The following example shows the commands that are used to logon and logoff Model 204:

To sign-on: `LOGON $III`

To sign-off: `LOGOFF`

Users desiring to establish new Model 204 files should contact TASC.

Security Features
RACF protects data from unauthorized access. In addition, Model 204 has security features that include individual logon accounts and passwords, as well as file passwords for accessing secure files or groups of files.

Web Access
Model 204 can be accessed through the Web using SILK (Secure Internet-LinKed) Web technology. Web users can issue Model 204 commands, execute existing Model 204 programs and APSY subsystems, and create ad hoc queries. To access Model 204 go to:

http://titan.nih.gov

and select the link for Model 204 and follow the menu-driven screens.

Model 204 commands that can be issued from a Web browser are include:

- LOGWHO (list all active Model 204 users)
- DISPLAY (PROCEDURES and FIELDS)
- VIEW (ERRORS, PARAMETERS, and UTABLE)
- DELETE PROCEDURE

APSY subsystems, such as BUMPME (remove an active user from the online system), can also be used.

Users can invoke stored or ad hoc Model 204 procedures that will return one-line reports, full-screen formatted reports, or print all information (PAI) unformatted reports. Output can be printed on a local or remote printer, or viewed from the browser. For more information on SILK, see Section 7.5.

7.3.3 Relational Database Access

There are currently no relational database systems running on Titan. However, client/server software allows access to relational databases stored on other platforms (e.g., Unix) through Titan.

Web Access

Relational database management systems are powerful partners in the Web environment. Applications can be developed that access relational databases, with a Web browser as their front end. Common gateway interface (CGI) scripts can be developed on most Web server platforms (e.g., Windows and Unix).

The SILK (Secure Internet-LinKed) Web technology can be used to develop sophisticated, host-based, Web applications to relational database management systems and other OS/390 data. See 7.5 for more information on SILK.

7.3.3.1 Client/Server Access to RDBMS

Client/server access to remote data in the relational database environment on a central server (such as the OS/390 South System) and Enterprise Open Systems (Unix) is available through a variety of application development and end user oriented client tools that can function effectively on a multitude of clients running Windows and Unix operating systems. The combination of factors such as a powerful server, a high-speed network (NIHnet), and user-friendly client software can provide significant benefits for users.

Oracle SQL*Net
Oracle SQL*Net is software that permits distributed processing by using the client/server architecture. Client/server architecture enables the integration of different computers, operating systems, and networks into a single unified computing and information source. Distributed processing is the division of processing between a front-end machine running an application (client), and a back-end machine (server) that services the requests of the application. Applications can run on one machine and access data on another machine.

For additional information, contact TASC.

7.4 PROGRAMMING LANGUAGES

The documentation for programming languages supported on Titan is available from the CIT publication ordering service. See Section 5.4 for information on ordering publications.

7.4.1 COBOL

COmmon Business Oriented Language (COBOL) is used for non-scientific applications. The version of COBOL on Titan is compatible with the American National Standards Institute (ANSI) standard and contains a number of IBM extensions. COBOL is based on a well-defined, restricted form of English.

A COBOL compilation can be initiated in foreground and batch (background) processing by entering ISPF. The TSO/ISPF COBOL compiler is found in ISPF panel 4.2 for foreground and panel 5.2 for batch.

7.4.2 VS FORTRAN

FORTRAN is one of the most commonly used languages for scientific and engineering applications. The VS FORTRAN compiler is available on Titan. The VS FORTRAN compiler meets the 1978 ANSI standard (also known as FORTRAN 77).

The VS FORTRAN compiler (Version 2 Release 3.0) is available from Titan interactively from TSO/ISPF and in batch mode. The TSO/ISPF VS FORTRAN compiler is found in ISPF panel 4.3 for foreground and panel 5.3 for batch.

7.4.3 PL/I

PL/I is a multi-purpose language used in business and scientific applications. PL/I contains most of the capabilities of FORTRAN and COBOL as well as some additional features.

The PL/1 Optimizer Compiler is the Titan PL/1 compiler and is available interactively from TSO/ISPF and in batch mode. The TSO/ISPF PL/1 compiler is found in ISPF panel 4.5 for foreground and panel 5.5 for batch.

7.4.4 High Level Assembler

The IBM Operating System High Level Assembler is a symbolic programming language used to write programs for the IBM OS/390 System. The language provides a convenient means for representing the machine instructions and related data necessary to program the IBM OS/390 System. Assembler Language is generally used for system programming where machine-dependent operations are required that cannot be performed using one of the higher-level languages such as COBOL or FORTRAN. The Assembler program processes the language, provides auxiliary functions useful in the preparation and documentation of a program, and includes facilities for processing the Assembler macro language.

7.4.5 REXX

REXX (Restructured EXtended eXecutor), which runs under TSO, provides a fully functional application development environment, including structured programming techniques, logical and arithmetic operations, and communication with the TSO end user. REXX features a choice of compiled or interpretive execution, convenient built-in functions, free-format coding, debugging capabilities, and very extensive parsing and character string manipulation.

The Compiler and Library for REXX provide a common user application interface so that REXX applications can be ported between OS/390, OS/2, and VM/CMS systems. The REXX Compiler and Library allow users to translate frequently used routines into compiled REXX programs. In addition, the REXX Library contains common routines that are accessible to all compiled REXX programs.

The REXX documentation is available from the CIT publication ordering service (under the TSO category). See Section 5.4 for information on ordering publications.

7.5 SILK WEB TECHNOLOGIES

SILK (**S**ecure **I**nternet-**L**in**k**ed) Web technologies were developed for users of the NIH Computer Center. Users can take advantage of SILK Web technologies to access any sequential data set or PDS member from a Web Browser, download files, issue TSO commands, change RACF passwords, and perform many other functions.

7.5.1 SILK Web-Based Services

There are many important Titan services that are available via SILK Web pages. Users can view SILK pages on their monitors, download them to a personal computer, or print them on local or remote printers. The data may be any type of output supported by Web browsers—including plain text, html, gif, jpeg or other binary files. All SILK reports are protected by RACF, the IBM mainframe security software.

In addition, Web RACF allows users to perform RACF functions. See Section 4.7.4. Titan Web Sponsor is a tool for account officials to make changes to accounts and display

information. See Section 2.3. The following figure provides a summary of SILK-based services.

Figure 7-1. SILK-Based Services for Titan

SILK-Based Service	Address
Account services – Titan Web Sponsor	http://websponsor.cit.nih.gov (See Section 2.3)
Model 204	http://titan.nih.gov/model204
RACF	https://titan.nih.gov/racf (See Section 4.7.4)
Public Server	http://titan.nih.gov/public
Secure Server	http://titan.nih.gov/secure
NIH TCP tools	http://titan.nih.gov/silkad/tcpip
TSO commands	http://titan.nih.gov/tsocmd
Utilities	http://titan.nih.gov/silkad/utility
NIH Titan DASDI Cost	http://titan.nih.gov/silkad/spcost
Tape inventory	http://titan.nih.gov/taperpt (See Section 10.2.5)
Webmail	http://titan.nih.gov/webmail
View or Download Mainframe Public Data Sets	http://titan.nih.gov/silkad/pubutil
View or Download Mainframe Private Data Sets	http://titan.nih.gov/silkad/privutil

7.5.2 SILK Web Server Options

There are currently two SILK Web server options available for Titan that allow users to display mainframe data:

- a public server (displays a file to anyone with a browser)
- a secure server (displays files to a limited group of viewers)

The owner of an OS/390 data set controls access to the data set being displayed. Access can be "universal" or can be restricted to individuals or groups by using mainframe RACF commands. SILK data sets are mainframe OS/390 data sets with full RACF protection—they can be made as secure as any other mainframe data set.

Public Servers

This server contains data available to anyone with browser software and an Internet connection. Data sets for public access should be defined in RACF with "UACC=READ."

Go to:

http://titan.nih.gov/public/

and then type in the name of the data set that you want to view.

Secure Servers
Anyone accessing the Titan SILK secure server must supply a valid Titan USERid (e.g., $III) and RACF password. The USERid will be checked for RACF authority to read the data set. It is the data set owner's responsibility to establish and maintain appropriate RACF control of Web accessible OS/390 data sets. This server utilizes RACF security features for access to stored data.

You can use both public and secure servers to view Titan data sets from the Web by creating a link such as:

http://titan.nih.gov/secure/dsname or http://titan.nih.gov/public/dsname

where "dsname" is your data set name.

For example:

http://titan.nih.gov/secure/$III.@WWW.MYDATA
http://titan.nih.gov/secure/AAA.@WWW.MYDATA

For more information concerning SILK Web technology on Titan, call TASC.

Creating and Naming Data sets for the Public and Secure Servers
In order to display the data set via SILK:

- Create a data set on the Titan system with "@www" as a qualifier in the data set name.
- Set the level of RACF control for the data set. This determines the access limitations.
- Use your Web browser to go to the Titan SILK Web pages.
- Enter the data set name on the secure or public Web page, depending on the level of RACF control set for the data set.
- Display, download, or print that data set.

The NIH Computer Center takes care of all server maintenance. All you need are a few simple lines of html code stored on the OS/390 mainframe. Examples of Web-enabled Titan data sets are:

$III.@WWW.MYDATA
AAA.@WWW.MYDATA

The naming conventions require the following elements:

- a Titan USERid
- "@www" as a qualifier. The "@www" naming convention adds an additional layer of security because it prevents Web access to other OS/390 data sets.
- The suffix HTM indicates HTML code. The suffix DSNCC indicates mainframe format with printer control characters in column 1.

For example: http://titan.nih.gov/public/pcc.sqn.@www.inter208.htm

The html code for the Web page above is stored as a mainframe data set:
PCC.SQN.@WWW.INTER208.HTM

This Web page was created entirely on the OS/390 mainframe using TSO as a command facility. You can examine the html code that created this page through TSO, if you have a Titan USERid. You can also view the code from your Internet browser—just use the View menu's "page source" option.

Web Interfaces for User Applications
Creating a Web interface for your mainframe applications makes them accessible with the easy-to-use features of a browser. Reports can be stored on the mainframe in Web-enabled formats, and appropriate accounts can access them. Queries can also be initiated from the Web, run against mainframe databases, and results returned to the initiator on the Web. The mainframe's RACF facility provides complete security for your data, and only authorized accounts will be allowed to see your Web data. Contact TASC for more information.

7.6 SCIENTIFIC STATISTICAL SYSTEMS

This section describes scientific statistical systems available on Titan. Contact TASC for more information on statistical packages or visit:

http://statsoft.nih.gov/

7.6.1 Statistical Analysis System (SAS)

SAS embodies an integrated approach to file management, data manipulation, statistical analysis of data, and report writing. SAS uses a simple parameter language to specify requests. Included in the language are statements that edit, transform, generate, describe, manage, and analyze data by building and operating on SAS data sets, VSAM files or sequential files. In addition to the basic SAS system, there are many other products in the SAS suite available on Titan. See Section 7.6 for the appropriate Web site.

TSO CLISTs
SAS is also available interactively under TSO through the following CLISTs:

%SAS	For initial entry into the system
%SAS GO	To reenter the system during the same TSO session.
%SUPPORT	Gives the entry into SAS NOTES and SAS SAMPLE libraries through a menu-driven facility.

To access SAS, select L (Local) from the CIT/Titan Primary Option Menu and then select the SAS option.

7.6.2 SPSS

SPSS (from SPSS, Inc.) is an integrated system of computer programs for data management and statistical analysis. This product provides the analyst with a unified and comprehensive system to perform many different types of data analysis. It includes procedures for data transformation, file manipulation, and statistical processing.

The cataloged procedure SPSS provides the basic JCL necessary for running this system. The user must supply DD statements, where required, for data input and output.

7.7 INTERACTIVE OUTPUT FACILITY (IOF)

The Interactive Output Facility (IOF) provides users with complete access and control over their generated print spool output and input batch jobs. IOF lets users track the progress of a job and view the output. There is a tutorial (Quick Trainer) and a help screen at every panel when viewing one's printed output, selected portions, or components of a spooled job. In the basic TSO environment, IOF will also run from the READY prompt. To invoke IOF, select IOF from the CIT/Titan Primary Option Menu, or enter IOF from the TSO READY prompt.

7.8 DOCUMENTATION SOFTWARE

IBM BookManager Online Documentation System

Titan supports IBM BookManager for viewing documentation online. Available materials may include user's guides, product specifications, maintenance manuals, procedures manuals, vendor's publications, reports, articles, and bulletins.

Online information has the familiar book appearance on the viewer's display screen, and provides many capabilities that include:

- open to a specific place in the book
- scroll forward and backward
- use the table of contents and index
- go directly to any chapter or topic
- group books on a bookshelf

- link to other books (hypertext)

To browse the BookManager Bookshelf List, which includes IBM manuals, go to the CIT/Titan Primary Option Menu. Select C for Products, and then select B for Books.

CIT only supports the READ function of BookManager. For additional information on IBM BookManager, contact TASC.

7.9 MAINFRAME E-MAIL

Users can send e-mail through the Titan system using a Web (Webmail) or batch (Sendmail) interface.

Note: The preferred electronic mail service supported by CIT is the Central Email Service (CES). The CES provides e-mail, scheduling, and other messaging services to the NIH community. NIH users are encouraged to take advantage of this service. There is no direct charge for this service to NIH ICs. Contact TASC for further information or go to:

http://www.mail.nih.gov/

7.9.1 Webmail

Webmail allows users to send e-mail from the Web with your Titan USERid. Among the options you can specify are:

- multiple addresses (To:)
- copies (CC:)
- blind copies (BCC:)
- an alternate return address for replies—the address where you receive your e-mail

To use Webmail, go to:

http://titan.nih.gov/webmail

7.9.2 SENDMAIL Procedure

The SENDMAIL utility is a batch procedure for sending e-mail from Titan. In the following example the headers and body of the mail are included in the job control language:

```
//WONMAIL JOB,MYNAME,MSGCLASS=A
//*
//S1 EXEC SENDMAIL
//MAILIN DD *
from: senderid@mail.nih.gov
to: recipient@mail.nih.gov
subject: mail test of SENDMAIL

body of e-mail
more body
end of e-mail
```

In the following example, there are two concatenated data sets, one containing the header, and one containing the body of the e-mail. The simpler Titan JOB statement is used.

```
//JOBNAME JOB
// EXEC SENDMAIL
//MAILIN DD DSN=headers-dsname,DISP=SHR
//       DD DSN=report-dsname,DISP=SHR
```

NOTES:

- The MAILIN DD statements can be any data set, with LRECL less than or equal to 240 that contains the e-mail lines. However, the LRECL of the header data set must be at least as long as the LRECL of the report data set.
- The "FROM:" record is required and should specify one valid e-mail address. Any delivery error messages will be sent to this address. Since Titan currently has no facility for receiving e-mail, the e-mail address should be on some other e-mail system where you already receive and read your e-mail.
- The "TO:" record is required and should contain one or more e-mail addresses separated by blanks, commas, or semicolons. In addition, multiple "TO:" records can be specified.
- The "SUBJECT:" record is not required, but should normally be specified.
- Additional e-mail header records can be added:

  ```
  cc: recipient@mail.nih.gov
  reply-to: reply@mail.nih.gov
  ```

  The "CC:" record can contain one or more e-mail addresses and there can be more than one "CC:" record.

  The "REPLY-TO:" record, if used, should contain one e-mail address to receive replies to the e-mail.

7.10 FILE MANAGEMENT SYSTEMS

The following file information systems run on Titan. They receive limited support at CIT.

7.10.1 VISION:Builder

VISION:Builder (previously known as MARK IV) is a general-purpose file management and reporting system. The system can process multiple coordinated input files, create multiple output files, update or create a new master file, retrieve data by selection criteria, and produce multiple user reports with summary statistics, all in a single pass of the master file.

VISION:Builder supports fixed and variable length sequential, and virtual sequential (VSAM) files. The system is easy to use due to system defaults and automatic operations. VISION:Builder is adaptable to most commercial data processing applications.

VISION:Builder can be run in batch mode using standard JCL or interactively from TSO/ISPF. In ISPF panel "C" Additional Products, select "VI" VISION WORKBENCH for interactive execution.

7.10.2 IRS

IRS is a general batch-oriented information management system. It provides the user with a fast, efficient, easy-to-use technique for extracting information from computer files, performing basic data processing operations, and producing printer, tape, and disk output. IRS can be run in batch mode only. IRS is an older product that is not fully supported by CIT. Use it at your own risk.

8 PRINTING SERVICES

This section describes the facilities provided for printed output produced at the central facility. A summary of the job control language statements used by batch jobs to select output options can be found in the manual *Batch Processing and Utilities at the NIH Computer Center*. Printing services are available through batch jobs and NIHnet connections (see Section 8.6).

All jobs in Output Hold on Titan are purged (except for CLASS=I which is printed) after 7 calendar days—this includes weekends. Jobs awaiting output for more than 14 calendar days will be purged even if routed to a remote or another NJE node.

All Titan output is printed at the NIH Bethesda site. Output designated for Parklawn boxes ("P" preceding the box number) will be delivered to the CIT Offsite Distribution Center in the Parklawn building (Room 2B-70). See Section 5.6.1.2 for messenger service information. All output printed on the central printers must have a box number associated with the job. On the Titan system, the box number for the job is actually stored in the field that JES2 calls "room." When the operators are sorting the output, any output that has a box number that begins with a "P" will be placed in the box corresponding to that number in the Parklawn building. If the box number does **NOT** begin with a "P," then the output will be placed in the box corresponding to that number in building 12A at NIH. Users who run jobs at other NJE nodes and then route the job to print on Titan must add a

```
/*JOBPARM ROOM=bbbb
```

statement after their JOB statement, where **"**bbbb**"** is the box number where the output is to be placed. If you want the output placed in one of the boxes in the Parklawn building, place the letter **"**P**"** in front of the box number. Without this `/*JOBPARM ROOM=bbbb` statement, your output may not print or may go to the wrong box or may be discarded.

For further information on printing services, contact TASC.

Figure 8-1. SYSOUT Classes

Class	Attributes
A	Output will be printed.
H	Output is in HOLD for 7 days to allow it to be viewed and disposed of by user. If it is still in HOLD after 7 days, it is purged.
I	Output is in HOLD for 7 days to allow it to be viewed and disposed of by user. If it is still in HOLD after 7 days, it is printed.
J	Junk–output is immediately discarded by JES2 without processing.
F	Output is sent to microfiche.
M	This is reserved for SMTP output.
T	Output is in HOLD for 7 days to allow it to be viewed and disposed of by user. If it is still in HOLD after 7 days, it is purged.

Note:
The use of any SYSOUT class other than those in this figure will produce unpredictable results and is not supported.

8.1 STANDARD PRINTING SERVICE

The standard printing service is the set of default printing attributes for users' printed output. The printing is done on continuous form laser printers that produce high quality output at approximately 229 pages per minute on continuous forms. Because there are always printers set up to produce "standard" format output, the standard printing service allows fast turnaround for printing. Very large jobs may, however, experience slightly longer turnaround times. See Section 9.5.1 for information on job turnaround times.

The standard printing service uses standard paper (11" x 8 ½" after removal of easy-strip margins) and the GT12 character set at 8 lines per inch. The printer uses a roll-feed paper system as input and produces fan-fold output in simplex mode (single sided). For further information on the IBM 3900 printer, see Section 11.1.1.3.

The laser printer produces high quality output. A laser light beam forms the characters by activating a portion of the paper that then attracts ink particles that are sealed on the paper by a heated drum. The shape of the character is under software control. Although the laser printers produce high quality output, they cannot be used to do the following: printing on

pressure sensitive labels; overprinting with any character except the underline; or printing within 1/2 inch of the top or bottom of a page.

Figure 8-2. Forms for Standard Printing

FORMS	Width x Length In Inches	Maximum Characters per Line at various pitches			Comments
		10	12	15	
STD	11 x 8 1/2*	110	132	165	continuous form printer

Note:
*Size is given with easy-strip margins removed.

8.2 CUT-SHEET LASER PRINTING

In addition to the standard printing service described above, there are a wide variety of forms and characters sets available on the cut-sheet laser printers. These printers offer double-sided (duplex) printing and many other options. While the standard printing service meets many users' printing needs, the additional capabilities of the cut-sheet laser printers make it possible to tailor printed output formats to meet the needs of specific applications. Figure 8-3 shows the forms available for the cut-sheet laser printing along with the recommended FORMDEF and PAGEDEF. The naming convention for the FORMDEFs is that the first character is L for landscape orientation or P for portrait, the second character is S for single-sided (also called simplex) or D for double-sided (also called duplex). The last 2 digits of the FORMDEF name should agree with the last 2 digits of the form name. The naming convention for the PAGEDEFs is that the first digit indicates the length of the page and the next 2 digits indicate how many lines are to be printed per inch.

Figure 8-3. Forms for Cut-sheet Laser Printing

Form Description	Width x Length In Inches	FORMS	FORMDEF	PAGEDEF	Maximum Characters per Line at Various Pitches		
					10	12	15
landscape, single-sided	11 x 8 1/2	900	LS00	808, 806, or 810	108	129	161
landscape, double-sided	11 x 8 1/2	900	LD00	808, 806, or 810	108	129	161
landscape, 3-hole punched, single-sided	11 x 8 1/2	999	LS99	808, 806, or 810	108	129	161
landscape, 3-hole punched, double-sided	11 x 8 1/2	999	LD99	808, 806, or 810	108	129	161
portrait, single-sided	8 1/2 x 11	900	PS00	1108, 1106, or 1110	83	100	124
portrait, double-sided	8 1/2 x 11	900	PD00	1108, 1106, or 1110	83	100	124
portrait, 3-hole punched, single-sided	8 1/2 x 11	999	PS99	1108, 1106, or 1110	78	94	117
portrait, 3-hole punched, double-sided	8 1/2 x 11	999	PD99	1108, 1106, or 1110	78	94	117
NIH letter head*	8 1/2 x 11	LH1	LH1	LH1	84	101	126

Note:
*Carriage control: LH1 requires use of ASA carriage control. A "2" is used to skip past the heading.

When printing at 8 lines per inch (PAGEDEF=808 or 1108), it is recommended that you use either a 12 or 15 pitch character set. When printing at 10 lines per inch (PAGEDEF=810 or 1110), it is recommended that you a 15 pitch character set. When printing at 6 lines per inch (PAGEDEF=806 or 1106), a character set of 10, 12, or 15 pitch should be satisfactory.

Figure 8-4. Maximum Printable Lines per Page

Form Description	PAGEDEF		
	808 or 1108	806 or 1106	810 or 1110
any landscape cut-sheet form	60*	45	75
any portrait cut-sheet form	80	60	100
STD continuous form	60	45	75

Notes:
*When printing on 3-hole paper in landscape orientation and double-sided (FORMS=999, FORMDEF=LD99, and PAGEDEF=808), use LINECT=59 to avoid having the holes cut off some of the characters on the back of the page.

8.3 IMPACT PRINTING

The slower impact printers are available for printing jobs that cannot be handled by the continuous form laser printers. Jobs requiring use of the impact printer may take up to 24 hours to be printed. Only the SN10 character set is available on the impact printers.

A job must be printed on an impact printer if the job requires:

- printing that extends across page boundaries
- overprinting with a character other than an underline
- printing on pressure sensitive labels or multi-part forms

8.3.1 Labels for Impact Printing

The laser-standard paper, available through the standard printing service, cannot be used on impact printers. The impact printers must be used for Computer Center-supplied labels and user-supplied forms. Computer Center labels are pre-gummed and are attached to sheets of waxed paper that contain the necessary pin-feed holes. The labels are arranged one across on the sheets. Samples are available at Output Distribution Services.

Data to be printed on labels by batch jobs must have valid carriage control characters in column 1 of each line. The carriage control characters to be used are shown in the table below. Each label name follows the pattern: lwdn where:

"l" stands for labels.
"w" is the width in truncated inches. (e.g., 2 is used for 2 3/4 inch wide labels)
"d" is the depth.
S for 7/16 inch (small)
M for 15/16 inch (medium)
L for 1 7/16 inches (large)
"n" is the number of labels across the page.

Figure 8-5. Labels for Impact Printing

FORMS	Label Size x Length	Number Across	Chars. Per Line per Label	Beginning Column for each Label**	Lines per Label*		Normal Carriage Control	Control Charac-ter for Print Line 1
					6 lpi	8 lpi		
L2S1	2 3/4 x 7/16	1	26	2	2	3	1, 2, 3	1, 2, 3
L3S1	3 1/2 x 7/16	1	34	2	2	3	1, 2, 3	1, 2, 3
L3M1	3 1/2 x 15/16	1	34	2	5	7	1, 2	4, 5
L4L1	4 x 1 7/16	1	38	2	8	11	1	4
L5L1	5 x 1 7/16	1	49	2	8	11	1	4

Notes:
* When the carriage control characters listed in the "Normal Carriage Control" column are used, printing starts on line 2 of each label. To get the maximum number of lines per label at a given density of lines per inch (lpi), use the Carriage Control Characters for print line 1 given in the right-most column of the table. Small labels always use print line 1.
** Column one is occupied by carriage control.

Figure 8-6. FCBs to Use With Labels

FORMS	FCB	
	6 lpi	8 lpi
L2S1	LS06	LS08
L3S1	LS06	LS08
L3M1	LM06	LM08
L4L1	LL06	LL08
L5L1	LL06	LL08

8.4 HARDCOPY UTILITY

The hardcopy utility is a series of panels that can be accessed by entering Option L.7 or 3.6 from the CIT/Titan Primary Option Menu. With this utility you can access JCL for printing on the printers described in this section. JCL for multiple-up, tilt (rotate), and duplex has been included to make printing your data sets as easy as possible. To use the hardcopy utility:

- Go to the CIT/Titan Primary Option Menu.
- Enter L.7 (a CIT-written panel that offers an easy way to get additional features such as 4-up (4 page images on a physical page), duplex, etc.)

or

enter 3.6 (the standard IBM panel)

- Provide the required information.
- Press ENTER.

If you use panel L.7 and wish to change any of the hard-coded JCL, change SUBMITTING=N to Y. You will receive the panel with the JCL that can be altered. At this point, you can make the desired changes. Then type SUB at the command line to submit the job. The JCL changes will revert back to the hard-coded JCL the next time you use it.

8.5 MICROFICHE SERVICES

The NIH Computer Center offers offline microform output on 105mm microfiche. The data to be produced on microfiche is written to a tape. The tape is transported to an off-site vendor where it is mounted on the COM (Computer Output Microfilm) unit and the data is written by a light beam onto a spool of photosensitive film. The film is then developed to produce the originals. Inexpensive duplicates can be produced if they are desired. The guaranteed turnaround for microform jobs is 24 hours. DXUTIL is an old, unsupported utility that provides the ability to program for microfiche through batch or TSO. CIT is looking into alternatives for current microfiche users.

8.6 NETWORK PRINTING SERVICES

Users can print output from the OS/390 System to a local networked printer using the VTAM Printer Support System (VPS). Printed output from batch jobs can be produced on printers attached to a PC, workstation, or local area network (LAN) connected to NIHnet or the Internet and running an LPD server. AppleTalk printers are also supported in conjunction with the PrintShare services provided by CIT.

Workstations connected to NIHnet or the Internet can transmit files via TCP/IP for printing on the OS/390 System's mainframe printers using SITE SUBMIT. See Section 6.5.5 for more information.

8.7 RJE WORKSTATION FACILITIES

Remote Job Entry Workstations are located at users' sites and communicate with the NIH Computer Center mainframes over telephone lines. Job output as well as individual SYSOUT data sets can be directed to a remote workstation. Because the remote workstations are obtained by individual organizations, they vary in their facilities, services, and regulations. (For example, different types of paper are offered by some remotes and not by others.)

For more information on remote workstations, see Section 11.1.2.

8.8 VTAM PRINTERS

VTAM printers are (usually low-speed) printers that are part of the SNA network and are located at users' sites. They are connected to controllers that communicate with the central facility via dedicated or switched lines. They can be defined as RJE printers and output routed to them uses their VTAM node name. See Section 11.1.2.

8.9 CHARACTER SETS AND PRINT TRAINS

Only the SN10 10-pitch print train can be used on the impact printer. A variety of font sizes (10, 12, 15, and tri-pitch) are available on the laser printers. The name of each character set is of the form "ttnn" where "tt" indicates the characters available and "nn" indicates the pitch or number of characters printed per inch (for example, SN10, PI12, GT15, and EBTR). Tri-pitch (TR) fonts have characters with three different widths; for example, the "w" is wider than the "i."

The character sets available for the laser printers are:

> BITR, BRTR, CE10, CE12, CI15, CN10, CO10, CR10, DOTR, D225, D226, D227, EBTR, EITR, ESTR, GB10, GB12, GI12, GR10, GT10, GT12, GT15, LB12, LR12, OA10, OB10, OR10, PB12, PI12, PR10, PR12, RT10, SB12, SE10, SE12, SI10, SI12, SN10, SN12, SN15, SO12, SR12, ST10, ST12, ST15, SY10, SY12, TN10

The following character sets are available on the cut-sheet laser printers only:

D225, D226, D227, CI15

A special 10-pitch font (OA10) is designed to be scanned by an optical character reader.

8.9.1 Character Sets for Laser Printing

A wide variety of character sets (fonts) are available for output on the laser printers. Up to 4 fonts can be used in any document printed on the cut-sheet laser printer; only 2 fonts may be used in a document printed on the continuous form laser printer. To view the character sets go to:

> http://datacenter.cit.nih.gov/print-ug

8.9.2 Hexadecimal Tables for Character Sets and Print Trains

To view tables showing the hexadecimal character representations for all available characters in each font (character set) and keyboard diagrams, go to the Web address above and click on "Hexadecimal Tables."

8.10 CARRIAGE CONTROL

The Forms Control Buffer (FCB) defines vertical spacing for a page of printed output. A data set can be printed using either machine carriage control or ASA carriage control. Machine carriage control uses unprintable hexadecimal characters in column 1 of each record of the data set to control vertical spacing. As its name implies, machine carriage control is the carriage control that printers actually use to control vertical spacing when printing on a form. ASA carriage control uses printable characters in column 1 of each record of the data set to control vertical spacing; the ASA carriage control characters are translated into machine carriage control by the JES2 component of the operating system before the output is printed.

A record format (RECFM) ending in A indicates that the data set has ASA carriage control; one ending in M indicates machine carriage control. If an invalid character appears in the carriage control column, the results are unpredictable. If a data set does not contain carriage control, the RECFM should not include A or M (e.g., RECFM=FB), and column one of each record of the data set will treated as text.

When carriage control characters (either ASA or machine) are used for controlling output spacing, two types of positioning can be used: line-oriented and channel-oriented. Line-oriented positioning specifies the number of lines to "move the carriage" before or after the line is printed. The line-oriented carriage control characters are defined by the system, and are NOT specified within the FCB.

In channel-oriented positioning, the FCB relates channel codes (1-9, A-C) to specific lines on a form. Channel-oriented carriage control characters initiate a vertical "skip" down the lines of a page. To terminate the skip, a channel code corresponding to the carriage control character must be coded in the FCB. This channel code marks the line on the form where the skip will terminate. For example, if the FCB defines channel 8 to relate to line 55 on a form, and a carriage control character of 8 is encountered in the output, the form will automatically advance to line 55 before printing resumes. As another example, if the FCB defines channel 11 ("B") to be associated with lines 14 and 45 on a form, and a carriage control character of B is encountered in the output, the form will automatically advance to either line 14 or 45, whichever is encountered first.

The JES2 component of the operating system requires that Channel 1 be defined in all FCBs. JES2 "skips to Channel 1" prior to printing the header and trailer pages on the output. For output other than labels, Channel 1 is always print line 4 for 6 lines-per-inch density, line 5 for 8 lpi, and line 6 for 10 lpi. Other channels may be set at vertical positions above Channel 1 for impact printing, but may not be set above Channel 1 in FCBs intended for the laser printers. For labels, Channel 1 should be defined near the top of the label and Channel 10 should be defined as the last print line before the perforation on a page of labels.

Line-Oriented Carriage Control Characters

ASA CODE (EBCDIC)	ACTION BEFORE WRITING PRINT LINE
blank	Advance one line
0	Advance 2 lines
-	Advance 3 lines
+	Do not advance

MACHINE CODE (HEX)	PRINTER ACTION
01	Print, then do not advance
09	Print, then advance 1 line
11	Print, then advance 2 lines
19	Print, then advance 3 lines
0B	Advance 1 line, do not print
13	Advance 2 lines, do not print
1B	Advance 3 lines, do not print
03	No operation

Channel Oriented Carriage Control Characters

ASA CODE (EBCDIC)	ACTION BEFORE WRITING PRINT LINE
1	Skip to Channel 1
2	Skip to Channel 2
3	Skip to Channel 3
4	Skip to Channel 4
5	Skip to Channel 5
6	Skip to Channel 6
7	Skip to Channel 7
8	Skip to Channel 8
9	Skip to Channel 9
A	Skip to Channel 10
B	Skip to Channel 11
C	Skip to Channel 12

MACHINE CODE (HEX)	PRINTER ACTION
89	Print, then skip to Channel 1
91	Print, then skip to Channel 2
99	Print, then skip to Channel 3
A1	Print, then skip to Channel 4
A9	Print, then skip to Channel 5
B1	Print, then skip to Channel 6
B9	Print, then skip to Channel 7
C1	Print, then skip to Channel 8
C9	Print, then skip to Channel 9
D1	Print, then skip to Channel 10
D9	Print, then skip to Channel 11
E1	Print, then skip to Channel 12
8B	Do not print, skip to Channel 1
93	Do not print, skip to Channel 2
9B	Do not print, skip to Channel 3
A3	Do not print, skip to Channel 4
AB	Do not print, skip to Channel 5
B3	Do not print, skip to Channel 6
BB	Do not print, skip to Channel 7
C3	Do not print, skip to Channel 8
CB	Do not print, skip to Channel 9
D3	Do not print, skip to Channel 10
DB	Do not print, skip to Channel 11
E3	Do not print, skip to Channel 12

8.10.1 Computer Center Forms Control Buffers (FCBs)

The following FCBs are provided by the NIH Computer Center:

FCB Name	Form Length (in inches)	Lines per inch
806	8 1/2	6
808	8 1/2	8
810	8 1/2	10
1106	11	6
1108	11	8
1110	11	10

These FCBs may be used with any registered form that is of the correct length. Thus, for an 11-inch form, 1106, 1108, or 1110 is valid. Each of these FCBs has the following carriage control characters defined:

Carriage Control Character	Action
1	Skip to the top of the next page.
2	Skip to the next half (middle or bottom) of the page.
3	Skip to the next third (one-third or two-thirds) of the page.
9	Skip to the next-to-the-last-line of the page.

8.10.2 Registering User Forms Control Buffers

Users can register FCBs that differ from those provided by the NIH Computer Center. Output Distribution Services should be contacted to perform the FCB registration. To complete this registration, the following information must be provided:

form length	the length of the form, specified in inches
vertical density	the number of lines per inch that will be used for the FCB. The values available are 6, 8, and 10 lines per inch. Please note that a separate FCB must be registered for each density that will be used with a given form.
channel codes	the channels to be defined and the line numbers that are to be associated with them. Channel 1 must be defined as print line 5.
person responsible	name, address, and telephone number of the individual responsible for the FCB

At the conclusion of the registration process, the person who is responsible for the FCB will be given a four-character FCB name. This FCB name must be specified in the user's JCL when the FCB is to be used.

8.11 USER-SUPPLIED FORMS

The NIH Computer Center provides for printing on custom-designed user forms. Such forms include pre-printed invoices, multi-ply forms, and card stock.

8.11.1 Registering and Supplying Forms

Each user-supplied form must be registered with Output Distribution Services before it is used for the first time. Jobs that request a non-registered form will not print or will be printed incorrectly. A specific form needs to be registered only once. If the form changes significantly (e.g., size, pre-printed material, number of parts), it should be re-registered. Once registered, a supply of the form must be delivered to Output Distribution Services each

time it is used. Only a small supply can be maintained because of space limitations and fire regulations.

Output Distribution Services requires the following information when a form is registered:

width	in inches (includes perforated margins and backing for labels)
usable width	how much of the width may be used for printing
length	in inches (a page or sheet of labels)
parts	number of plys
FCB	the name of the Forms Control Buffer (FCB) that will be used for the form. Several FCBs are provided by the NIH Computer Center and one of these, or a user-supplied FCB, may be specified. However, the FCB must always be included in the user's JCL when the form is requested.
character set	the name of the character set to be used with the form. See Section 8.9 for information on character sets.
alignment data set	the name of a data set that can be used to verify form alignment. This data set should contain valid carriage control characters.
sample page	a sample listing of the alignment data set printed with proper alignment should be supplied. To make this easier, the form may be pre-registered by contacting Output Distribution Services.
person responsible	name, address, and telephone number of the individual responsible for the form

At the conclusion of the registration process, the person who registered the form will be given a four-character form name of the form Fnnn. This Fnnn name must be specified in the user's JCL when the form is to be used.

8.12 TABLE REFERENCE CHARACTERS (TRC)

Four fonts (character sets) may be used in output printed on the cut-sheet laser printers; 2 may be used on the continuous form laser printers. Therefore, there must be a way to indicate which portions of the output are to be printed in each font. For batch job output, this is done with table reference characters (TRCs) and the CHARS= parameter. The DCB subparameter OPTCD=J must be used to describe the data set. The TRCs occupy a column to the left of the text, following the optional carriage control column. A TRC of blank or "0" is used to select the first font; "1" selects the second font.

The following example uses "0" and "1" in the TRC column to print a small table in 15-pitch characters when the rest of the text is printed with the PR12 font.

```
0Often within output, it is desirable to be able to switch to a
0smaller character set such as the Gothic Text 15-Pitch which allows
0a table that might be too wide to fit on the page.
0
1Data Group 1    Data Group 2     Data Group 3     Data Group 4
1exercised       exercised        sedentary        sedentary
1normal weight   overweight       normal weight    normal weight
1non-smoker      smoker           non-smoker       smoker
1normal bp       normal bp        normal bp        hypertensive
```

The printed output would look something like the following:

Often within output, it is desirable to be able to switch to a
smaller character set such as the Gothic Text 15-Pitch which allows
a table that might be too wide to fit on the page.

Data Group 1	Data Group 2	Data Group 3	Data Group 4
exercised	exercised	sedentary	sedentary
normal weight	overweight	normal weight	normal weight
non-smoker	smoker	non-smoker	smoker
normal bp	normal bp	normal bp	hypertensive

The DD statement for the output data set could be:

```
//GO.OUTPUT DD SYSOUT=A,
// DCB=(BLKSIZE=130,RECFM=F,OPTCD=J),CHARS=(PR12,GT15)
```

To mix two fonts within a line, TRCs and carriage control must be used. As the next example shows, a "+" carriage control character in column 1 can cause a line printed in one character set to be overlaid with characters from another.

```
 0This is a test of trc characters and      fonts on the
+1                                        dual
 0continuous form printer.  It will show how trc characters
 1can be used to create font changes within lines as well
 0as between lines.
```

The printed output would look something like the following:

This is a test of trc characters and **dual** fonts on the
continuous form printer. It will show how trc characters
can be used to create font changes within lines as well
as between lines.

The following DD statements describe the output data set:

```
//SYSPRINT DD SYSOUT=A,
```

```
//  DCB=(BLKSIZE=80,RECFM=FA,
//  OPTCD=J),CHARS=(SN10,GB10)
```

The record format (FA) indicates that the data set contains carriage control characters in column 1. Remember that the program must write the TRCs in front of each line of the output.

9 BATCH JOB SERVICES

The batch processing facility of the OS/390 Titan system allows users to submit a job or computer program to the mainframe processors. Users can then print the output or examine it at their desktop workstations.

The NIH Computer Center provides an extensive set of batch utility programs to aid the user in the areas of data management and manipulation. Refer to *Batch Processing and Utilities at the NIH Computer Center* for complete information on running batch jobs, job class summaries, job turnaround times, job control language statements and the procedures for using batch utility programs.

Users can submit batch jobs by executing TSO commands through the Web at:

http://titan.nih.gov/tsocmd

9.1 OPERATING SYSTEM OVERVIEW

The IBM OS/390 Titan operating system, introduces programs to the computing system, initiates their execution, and provides all the resources and services necessary for the programs to carry out their work. The operating system is made up of a general library of programs that can be tailored to meet many requirements. The installation can select the systems programs that it needs, add its own programs to them, and update existing programs as needs change.

For illustrative purposes, the programs and routines that compose the operating system are classified as a control program and processing programs. The main functions of the control program are to accept and schedule jobs in a continuous flow (job management); to supervise on a priority basis each unit of work to be done (task management); and to simplify retrieval of all data, regardless of the way it is organized and stored (data management). The processing programs consist of language translators (such as the FORTRAN compiler), service programs (such as the Binder), and problem programs (such as users' programs). The processing programs are used to define the work that the computing system is to do and to simplify program preparation. For a description of the Titan operating system, see Section 7.1.

9.2 JOB CONTROL LANGUAGE OVERVIEW

Job Control Language (JCL) is the means by which the user communicates the resource requirements for a job to the operating system and various components of the OS/390 systems. Through JCL, the user instructs the computer what to do with programs, data sets, and I/O devices.

Former North System JCL is still supported and should work on Titan, so it is expected that most users' jobs will run on Titan with little or no change. For more information on the Titan transition, go to:

http://silk.nih.gov/silk/titan

Titan uses software called ThruPut Manager to convert JCL from the former OS/390 systems to run on Titan. It recognizes the format of an incoming JOB statement, converts the JCL, and directs output to the appropriate printers. In addition, ThruPut Manager controls the flow of jobs in Titan. When a job needs tapes, it schedules the job accordingly.

The Titan JOB statement follows the conventions documented in the IBM JCL manuals. An example of a Titan JOB statement is:

```
//JOBNAME JOB (AccountInfo),pgmrname,CLASS=jobclass,LINES=nnn,....
```

All parameters in italics are optional. The simplest valid JOB statement on Titan is:

```
//JOBNAME JOB
```

Please refer to the *IBM OS/390 MVS JCL Reference, GC28-1757* for details of the various fields. In addition, see the manual *Batch Processing and Utilities at the NIH Computer Center*.

9.3 MAXIMUM LIMITS FOR BATCH JOBS

The following overview defines maximum limits for batch jobs.

Figure 9-1. Maximum Limits for Batch Jobs

LIMITS FOR A SINGLE JOB	
Number of steps	255
Number of instream procedures	15
Region (below the line)	6144K
Lines output	4 million
Scratch disk space allocated at one time (tracks)	100,000
Contention suspension	30 min.
LIMITS ON NUMBER OF JOBS FROM ONE USER	
Total jobs in the system	150
Jobs AWAITING EXECUTION and EXECUTING	50

In addition to the "below the line" region requested by the REGION parameter (below the 16-megabyte line in virtual storage), each job is automatically assigned at least 96MB

(98,304KB) of requestable virtual storage above the 16-megabyte line (requiring 31-bit addressing for use).

The limits on numbers of jobs apply to jobs submitted by a single user. These limits are necessary to prevent overloading the operating system queues and to allow timely processing of jobs for all users. The limit on total jobs includes jobs in all categories (AWAITING EXECUTION, EXECUTING, AWAITING PRINT, IN OUTPUT HOLD, etc.). Jobs awaiting output (e.g., printing) for more than two weeks will be purged.

A maximum of 100,000 tracks (4,747,600,000 bytes) of public disk scratch space can be allocated to a job at any one time. Space allocated to a temporary data set that is passed among the steps of a job is counted as part of this total until it is deleted. If a job exceeds the maximum, it will be canceled, and no refund will be allowed.

The following maximum limits for batch jobs have more restrictive standards in most job classes.

CPU time	20,000 seconds
Region (above the line)	512MB
Tape drives in use at one time	7
Reel tape drives in use at one time	2

9.4 RESTRICTIONS

CIT does not support certain JCL parameters on Titan—for example, those that may require operator responses, or those related to functions, products, and hardware that are not installed on the system. Additionally, CIT does not support JES2 functions requiring special data sets (e.g., checkpoint/restart).

The following job control language parameters should not be used at this facility:

JOB statement	**EXEC statement**	**DD statement**
PERFORM	ACCT	CHKPT
PRTY	DPRTY	DSID
RD	PERFORM	QNAME
	RD	SUBSYS

In addition, do not use:

- JES3 parameters not supported by JES2
- JES3 statements
- JES2 command statements

- JCL COMMAND statements
- COMMAND statements

For more detailed information on job control language and IBM utilities, see the manual *Batch Processing and Utilities at the NIH Computer Center* and IBM documentation.

9.5 JOB CLASS SUMMARY

Jobs are assigned to execution classes based on the system resources requested. There are two execution classes on Titan:

- L for long – This is the default class.
- X for express - In general jobs that execute in Class X receive a higher scheduling priority than jobs that execute in Class L.

Execution class is determined in one of two ways:

- The `TIME=` parameter can be specified on the JOB statement. This is an estimate of the CPU time the job is expected to consume expressed in minutes and seconds. For example, if a job is expected to use 150 seconds of CPU time, the parameter would be coded as `TIME=(2,30).` For **Titan-style** JOB statements, the TIME= parameter determines what execution class the job will run in. If no TIME= parameter is coded for these jobs, the job will execute in Class L.

  or

- The SUBMISSION CLASS specified on a **North-style** or **South-style** JOB statement. This option is provided to ease the transition from the North and South systems to Titan.

A **North-Style** JOBstatement is defined as having a three-character agency code, followed by a five-character project code in the JOB statement accounting parameters. For example:

```
//JJJ  JOB (aaa,ppppp),CLASS=...
```

A **South-Style** JOB statement is defined as having a four-character account code, followed by a one to four-character mail box number in the JOB statement accounting parameters. For example:

```
//JJJ JOB (aaaa,bbbb,C,...)
```

In contrast, a **Titan-Style** JOB statement has **NO** accounting parameters. For example:

```
//JJJ JOB

 or

//JJJ JOB ,TIME=
```

Figure 9-2. Resource Limitations by Job Class

Titan Job Class	CPU Time	Lines Per Job (1000s)	North Job Classes*	South Job Classes*	JCL
X (eXpress Default Maximum	 30 100	 50 999	 E, B, A	 A, B, F	These jobs execute first. Any Titan JOB statement with CLASS=X or Any Titan JOB statement with TIME=(1,40) or less
L (Long) Default Maximum	 400 59940	 50 999	 C, D, H, F, R, S	 C, D, E, H	The default job class—no CLASS= coding is necessary. or Any Titan JOB statement with TIME=(1,41) or greater
O** (Overnight)			O		Executes after 5:00 p.m.
W** (Weekend)			W		Executes after 5:00 p.m. Friday

*A North or South System JOB statement coded with former North or South job classes will translate into either an X or L Titan class, as defined above.

**CLASS=O and CLASS=W are not actually Titan job classes and may execute in either Class X or L above, but will be queued to execute after 5 p.m. (for CLASS=O) or after 5 p.m. on Friday (CLASS=W).

The following examples show how various **Titan-style** JOB statements translate into job classes.

```
//jobname  JOB
```
This job executes in Class L.

```
//jobname  JOB ,TIME=(,30)
```
This job executes in Class X.

```
//jobname  JOB ,CLASS=O,TIME=(,10)
```
This job begins after 5 p.m. and executes in Class X.

```
//jobname  JOB ,CLASS=W
```
This job begins after 5 p.m. Friday and executes in Class L.

The following examples show how various **North-style** JOB statements translate into Titan job classes.

`//jobname JOB (aaa,ppppp)`	This job executes in Class L.
`//jobname JOB (aaa,ppppp),TIME=(,30)`	This job executes in Class X.
`//jobname JOB (aaa,ppppp),CLASS=C`	This job executes in Class L.
`//jobname JOB (aaa,ppppp),` `//  CLASS=R,TIME=(,10)`	This job begins after 5 p.m. and execute in Class X.

The following examples show how various **South-style** JOB statements translate into Titan job classes.

`//jobname JOB (aaaa,bbbb,A)`	This job executes in Class X.
`//jobname JOB (aaaa,bbb,C)`	This job executes in Class L.

9.5.1 Job Turnaround

When a job has completed execution, it enters a queue to be printed or it is placed in output HOLD (from which the user can selectively examine the output at a workstation). Use IOF (see Section 7.7) to track the progress of a job and to look at the job output.

Output turnaround is from the time a job enters the print queue until the output has been placed in the user's output box. Time can vary widely depending on the services chosen. For jobs printed at the central facility with the standard printing requirements, the time for the job to be printed, separated from other jobs, and routed to the appropriate output box will normally be two hours or less during non-discount periods. The time required for the output to be placed in the box will vary since courier times may be involved (e.g., for output directed to the boxes located at the Parklawn site). For information on the courier service, see Section 5.6.1.2.

9.6 UTILITIES AND CATALOGED PROCEDURES

Titan system utilities and cataloged procedures are described in *Batch Processing and Utilities at the NIH Computer Center*. See Section 5.4 for information on viewing and ordering documentation.

10 STORAGE AND BACKUP OF DATA

The NIH Computer Center offers a variety of data storage facilities. All users share public disk storage, or DASD (direct access storage devices). Public disk storage permits:

- online storage of data sets (both long-term and short-term storage)
- scratch space (for use during the processing of a batch job)

Magnetic tape facilities are also available—both for data storage at the NIH Computer Center and for data exchange with other installations. The NIH Computer Center has an automatic tape inventory system that ensures the privacy and integrity of data on tapes.

See Section 11 for the hardware specifications for storage devices.

Data set access, whether it is on tape or disk, depends on having the appropriate RACF profiles in place; see Section 4.7 for information. Any user who handles or stores personal data as defined by the Privacy Act of 1974 has legal responsibilities for maintaining its security and integrity. For further information, see Section 4.

The NIH Computer Center does not provide for archival storage of data. Data to be archived should be copied to tape and permanently removed from the NIH Computer Center.

Backups of Titan disk data are sent off-site on a regular schedule.

Data Set Names

On Titan, data set names (disk or tape) must begin with either:

- a USERid (userid.dataname)

or

- a Titan account (aaa.dataname or aaaa.dataname).

Data set names that begin with an account (aaa.dataname or aaaa.dataname) are ideal for production work. Because they do not belong to an individual, they do not need to be renamed if the USERid is reassigned.

10.1 PUBLIC DIRECT ACCESS STORAGE

There are several advantages to using direct access facilities instead of tapes:

- There is no delay in the processing of a job while tapes are being mounted. The direct access volumes are always mounted and available. (Even when a data set is recalled from tape, access is generally quick.)

- Several jobs can read the same data set at the same time. A tape can be used by only one job at a time.
- Jobs may fit in a higher priority class since no tapes are required.
- Jobs accessing the data will be less expensive because the charging factors for tapes will be avoided. See Section 3 for specific details on costs.

The NIH Computer Center operates an all-cataloged disk storage environment. All data sets must be cataloged, and all references to data sets should be made through the catalog.

It is important to remember the following:

- All data sets must be cataloged.
- Neither UNIT nor VOLUME should be specified when referencing existing, properly cataloged data sets. Just specify DISP=SHR and the DSN.
- If a data set cannot be cataloged (probably because another data set with the same name is already cataloged), the job will fail and the data set will not be created.

Space Management of Disk Data Sets

In the near future, Titan will use IBM's SMS (System Managed Storage) and DFHSM (Data Facility Hierarchical Storage Manager) software as the primary storage management products for data set migration and backup. Largely transparent to users, this storage system provides efficient management of disk data.

In the interim, Titan will continue to use the disk data set management and archiving software system that the North System used, Automated Backup And Recovery (ABR). The following section documents both ABR, which is in effect now, and the DFHSM disk storage environment planned for the future.

10.1.1 Automatic Backup and Recovery (ABR)

The FDR/ABR DASD Management System is composed of three major subsystems—incremental backups, archiving, and disk (DASD) management reporting.

Incremental Backup

Incremental backup is the process of making a copy of disk data sets so that they may be recovered if damaged or inadvertently deleted. The backup job automatically selects for backup all data sets that have been modified during the current workday. Users may restore any data set to an earlier generation by reloading it from the backup files. A full volume

backup is provided every Saturday and incremental backups are run Sunday through Friday nights.

Archiving
Archiving is the process of removing data sets from Public disk and putting them instead on less expensive compressed disk and tape. The NIH Computer Center will automatically archive any data set on public online disk which:

- has not been accessed in 75 days
- exceeds 9,999 tracks of allocated space

Each night, the archive program is run on Titan on all public storage volumes. Users can invoke the archive process on an individual data set when they feel it is appropriate. An archived data set will be retained on compressed disk for 30 days and on 3490 cartridge for 670 days.

Note: These time frames run concurrently. After 670 days from archival, the data set is purged from the system.

If an archived data set is referenced by a user (in batch or TSO), ABR automatically recalls the data set. If the backup copy on disk has not expired, ABR will restore the disk backup immediately without operator intervention. If the backup on disk has expired (been archived more than 30 days), ABR will call for the backup tape.

Archiving is not intended to be a permanent backup for disk files. Data sets that must be held for a period longer than 670 days should be dumped to a NIH Computer Center library cartridge tape with the FDRDSF Utility. Refer to *Batch Processing and Utilities at the NIH Computer Center* for more information.

DASD Management Reporting
ABR gives the user extensive reporting capabilities. The reports reflect both the status of the disk volumes and the backups and archives contained within the ABR system. ABR supplies a number of standard report formats, or users may customize their own reports.

10.1.1.1 ISPF Panels

ABR provides users with panels that operate under the Interactive System Productivity Facility (ISPF) under TSO. These panels give users easy access to most of the functions under ABR. These panels are easy to use and contain complete tutorial (HELP) panels and messages. The ABR/FDR TSO/ISPF interface is available by first selecting "C" from the ISPF/PDF Primary Option Menu and then selecting "A" for ABR/FDR from the Additional Products menu. The following panels are provided:

- REPORTS - ABR reporting functions
- RESTORE - ABR data set restore

- ARCHIVE - ABR data set archive
- INC-BACKUP - ABR data set backup
- JCL PARMS - Specify FDR JCL and SYSOUT defaults
- FORMAT - Modify format of generated reports
- MESSAGES - FDR messages and codes query facility
- QUERY - FDR/ABR statistics query
- SRS - SEARCH, REPORT, SERVICES DIALOG

10.1.1.2 ABR CLISTs

Two CLISTs are available to perform ABR functions in line mode through TSO—the LISTARC command that produces an online archive report, and the RESTARC command that submits a batch job that restores archived data sets. The command format is as follows:

```
LISTARC DSN($III.AAA.test.data)
LISTARC DSG($III)
```

- The TSO LISTARC command will display information concerning an individual archived data set. The second will display information about all data sets archived beginning with the prefix $III.

- The TSO RESTARC command will allow users to restore one or more archived data sets in a single command. Users will be prompted for the name(s) of the data set(s) to be restored if not provided. The format of this command is as follows:

  RESTARC DSN(dsname,VOL=(volser),NVOL=(new volser)

For assistance enter: HELP LISTARC or RESTARC for additional information.

For information on ABR online messages, refer to *Batch Processing and Utilities at the NIH Computer Center*.

10.1.1.3 ACS WYLBUR Commands

ACS WYLBUR users may execute the WYLABRP command to perform ABR reporting functions and WRECALL command to restore an archived data set.

The following example archives information concerning an individual data set:

```
WYLABRP ARCHIVE DSN=AAA.III.test.data
```

The following example displays archive information about all data sets beginning with prefix AAA.III:

```
WYLABRP ARCHIVE DSN=AAA.III.test.data
```

The following example reloads an individual data set from archive:

```
WRECALL DSN=AAA.III.test.data,OVOL=nnnnnn,NVOL=nnnnnn
```

Where: nnnnnn = Original volume location, and NVOL = Optional field to be used to relocate data set to another volume, if desired.

****

The following section documents the policies in effect once Titan converts to using the DFHSM and SMS software products to manage disk storage.

10.1.2 SMS/HSM

All public disk volumes are under the control of the System Managed Storage (SMS) and Hierarchical Storage Manager (HSM) environment.

SMS

SMS facilitates storage management and provides simplified data set allocation, economical flexibility in the maintenance of disk data sets, high performance, and the facility for easy transitions to new disk architectures. SMS provides five management classes for public data sets: DISK2YR, DISK7YR, LONGTERM, TEMP, and NOBACKUP. These management classes determine which data sets are backed up and how long the data is kept. Data sets are directed to pools of volumes based on space requirements rather than management criteria. Since data is managed at the data set rather than the volume level, data sets from the different management classes can coexist on the same physical volume.

HSM

HSM (Hierarchical Storage Manager), a part of SMS, manages data sets on groups of storage volumes. HSM keeps new and actively used data sets on a group of "primary" disk volumes, moving less frequently accessed data sets onto HSM-owned "secondary" disk volumes and tapes. HSM keeps track of where each data set resides, moving ("migrating") data sets off primary volumes as space is needed, and automatically "recalling" them as they are accessed.

When a public data set is created, it is placed on one of the primary disks. As these disks start getting full, the least active data sets are moved to secondary volumes. When an interactive user, or a batch job references (via the catalog) a data set on secondary storage, HSM automatically brings the data set back to one of the primary volumes. Interactive users may notice a short delay while HSM moves the data set from the secondary volume back to a primary disk. While the data sets are on these secondary volumes, the catalog indicates that

they are on a volume named MIGRAT. Under ISPF, the volume shown for data sets that have been migrated to compressed disk will be MIGRAT1; the volume shown for data sets that have been migrated to tape will be MIGRAT2.

When data is migrated to secondary storage and recalled, the data set is reallocated on primary storage. Unused space is released for sequential and partitioned data sets with a secondary space allocation. For other data sets, and sequential and partitioned data sets with only a primary space allocation, the previous total space allocation is restored, including unoccupied space. In general it is recommended that sequential and partitioned data sets include a secondary space allocation so that space is only allocated as it is actually needed. Partitioned data sets are always condensed when recalled, moving all members to the beginning and all unused space to the end of the data set.

There is no way to guarantee that a data set will remain on any particular disk volume or that two data sets will always be on different volumes. SMS determines which disk in the primary group to use when the data set is returned, and updates the catalog appropriately.

10.1.3 Incremental Backup and Recovery for Data Sets

IBM's Hierarchical Storage Manager (HSM) creates incremental backups of data sets each day. Backups are performed only for data sets that have been modified, created, or renamed since the last backup run. This process is carried out early each morning to back up the previous day's changes.

HSM retains a maximum of 5 backup versions **per data set name**. Incremental backup is provided for data sets in the DISK2YR, DISK7YR, and LONGTERM management classes. Backups are kept for six weeks after the data set has been deleted (or renamed). The list of incremental backups for a data set can be displayed via ISMF under ISPF.

All changed data sets are backed up with the following exceptions:

- data sets with no DSORG (empty) or partitioned (PO) data sets with zero block size
- data sets that cannot be read (damaged PDS directory, etc.)
- data sets that are allocated with a disposition of OLD at the time HSM is trying to back them up

Incremental backups may be recovered via ISMF under ISPF. While these backups provide a great amount of protection for user data sets, it is not absolute. Critical data sets should be periodically saved by the user on tape and removed from the NIH Computer Center premises. See Section 4.5 for information on disaster recovery.

10.1.4 Titan Management Classes

The Titan management classes are shown below (not including those specific to databases).

Figure 10-1. Characteristics of Management Classes

Titan Management Class	Backups	Length of Retention	Former Unitname(s)
TEMP	no	7 days	South TMP North SYSTS
NOBACKUP	no	until deleted	South MSS
DISK2YR	5	2 years after last use	North PUB, PUBL, WYL
DISK7YR	5	7 years after last use	-
LONGTERM	5	until deleted	South FILE

Titan accepts the former NIH OS/390 North and South systems' unitnames in Titan batch jobs. The unitnames, coded in the JCL, will translate into the Titan management classes specified above to designate how data is to be stored.

Some data set naming conventions assume specific management classes:

Management Class	Final Qualifier of Data Set Names
TEMP	OUTLIST, SYSOUT, LIST*, OUT*
LONGTERM	ASM, COB*, FOR*, PLI, PL1, CNTL, JCL, CLIST, LOAD*, PGM*, RESLIB, EXEC, LLIB, *LIB, SCRIPT, SOURCE, SRC, TEXT

Note: An asterisk (*) in the above table indicates a "wildcard" of zero or more characters. For example, LIST* would include LISTING, LIST, LISTER, etc.

The default management class for data sets created through TSO is DISK2YR. The TSO command TSO UNITNAME can be used to change the default. A user can execute this command at logon by including this command on the command line at the logon screen or in a CLIST that is executed from that line.

Additional information

- The system will delete any rolled-off GDG unless the expiration date has not been reached (if one was specified).

- To allow users to more effectively manage their disk data sets, EXPDT= or RETPD= can be coded to provide more specific expiration of their data sets than the broad categories offered above.

10.1.5 ESTIMATING DIRECT ACCESS SPACE REQUIREMENTS

When allocating disk data sets, it is important to determine the best block size for the data set and the right amount of space needed to store the data. Miscalculating the amount of space needed (via blocks, tracks or cylinders) or specifying a block size that is too small or too large can lead to wasted disk space and increased storage costs. Specifying a block size that is too small can also cause an increase in I/O charges for the job that reads or writes the data set.

The best way to allocate space is to allow the system to pick the optimum blocksize. When a data set is created this way, it will be automatically reblocked to a new optimum block size if the data set has to be moved to a new disk device with different track/cylinder architecture.

When creating data sets through batch processing, if you know the approximate number of records you expect to put in a data set and the length of the records (or average record length for variable length records), the AVGREC parameter can be used to allow the operating system to automatically calculate both the optimum block size AND space required for most physical sequential (PS) and partitioned (PO) data sets. Refer to the manual *Batch Processing and Utilities at the NIH Computer* Center for suggestions on using the AVGREC parameter.

10.2 TAPE STORAGE

Most Titan customer tape data resides in the Virtual Storage Manager (VSM)—a comprehensive tape storage system consisting of tape silos, disk buffers, new tape technology, and tape management software that improves performance and reduces human intervention in storing, retrieving, and mounting tapes. All VSM tapes are numbered above 500000.

Major features of the Titan tape storage system are as follows:

- The NIH tape library contains mainly 3490 cartridge tapes.
- The only 9-track and 3480 tapes kept at NIH will be in a scratch pool.
    - If a user creates a 9-track or 3480 tape from this pool, the tape will automatically be purchased and removed from the NIH Computer Center.
    - All 9-track and 3480 tapes will be treated as foreign tapes. Refer to *Batch Processing and Utilities at the NIH Computer Center* for information on foreign tape processing.
- Tape data set names must begin with a valid USERid or RACF group (account).
- Tape data sets must have an expiration date/retention period.

- Tape data set security on Titan is handled by RACF permissions on a data set rather than volume basis. For additional information, see Section 4.7.

10.2.1 Tape Management System TMS/CA1 Features

Titan uses the TMS/CA1 tape management software system to maintain accountability of the tapes in the tape library. The system records the tape serial number and the data set name and characteristics in an internal catalog when the cartridge tape is created. The catalog does the following:

- verifies that the proper cartridge tape is mounted
- produces comprehensive inventories of magnetic cartridge tape allocations by registered agency and individual user

Data set Expiration Dates and TMS

Users should become familiar with the TMS procedure for establishing and maintaining expiration dates of tape data sets. These procedures prevent inadvertent or premature release of tape data sets. Important points to be considered are:

- There is no "default" expiration date for tapes. Instead, users must specify an expiration date or retention period on the DD statement when they create or recreate a data set. **JCL that creates a new tape data set and does NOT include expiration information (EXPDT= or RETPD=) will FAIL**.
- The expiration date is specified on the DD statement through either the EXPDT or RETPD subparameters of the LABEL parameter. EXPDT is a 7-digit Julian date and RETPD is from one-to-three digits indicating the number of days to retain the tape from the date of creation.
- The expiration date can be extended or altered by other methods. See Section 10.2.5.
- The expiration date of 98000 means that the tape being processed is a special/foreign tape and is outside of the TMS tape inventory.
- The expiration date of 99000 means that the tape data should be kept until it is uncataloged.
- The expiration date of 99365 means that the tape data should be kept indefinitely. Use of this special code also means that the tape data set cannot be MODed onto.
- Multi-data set tapes are retained until all expiration dates on the tape have expired.
- Processing a data set for input does not affect its expiration date. However, output processing affects expiration dates in the following manner:
    - The expiration date is reestablished whenever a tape is used for output. The retention period must be specified on the DD statement.

- If a tape is "OPENED" for output and is not successfully "CLOSED" by the processing program (i.e., it is closed by abnormal termination processing), the retention period for the tape will be five calendar days regardless of what may have been specified on the DD statement. This is based on the assumption that any data set closed by abnormal termination processing is going to be recreated later in a successful run. However, the five-day period allows the user time to take action to keep the data if it has some value. This applies both to creation of new data sets and to recreation of existing data sets.
- The DISP=MOD parameter of the DD statement, used to append data to an existing data set, does not change the expiration date.

Tape Unitnames
The following unitnames refer to the standard NIH tapes:

- TAPE, CTAPE - virtual 3490 standard tapes in the NIH tape library

The following unitnames refer to incoming foreign tapes or tapes to be written outside of the VSM for removal from NIH. These tapes are not under control of the tape management system:

- FRGN6250, 9TRACKHI - 9-track 6250/1600 bpi tape unit (the default output density is 6250 bpi)
- FRGN3480 - 3480 cartridge tape unit.
- FRGN3490 - 3490 cartridge tape unit.

The following examples illustrate a data set with expiration date and retention period specification. In this example, the cartridge tape will be retained until the 115th day of 2003.

```
//DD1 DD UNIT=CTAPE,DSN=AAA.III.MYTAPE1,DISP=(,KEEP),
//  LABEL=EXPDT=2003/115
```

In the next example, the cartridge tape will be retained for 130 days from the date of creation.

```
//DD2 DD UNIT=CTAPE,DSN=AAA.III.MYTAPE2,DISP=(,KEEP),
//  LABEL=RETPD=130
```

10.2.2 TMS Error Conditions

Various system completion codes and informative messages can result during TMS processing. The more serious abnormal situations result in the job step being abnormally terminated by TMS with a system completion code of the form nEC where n can be from 1 to 6. Refer to *Batch Processing and Utilities at the NIH Computer Center* for more information.

Another abnormal situation occurs when a scratch tape is requested for output and TMS does not accept the mounted tape as a scratch. TMS issues a "NOT A SCRATCH" message with

an accompanying ERROR code and requests another tape. If the situation resulted from improperly coded DD statements, the job will be terminated. Refer to *Batch Processing and Utilities at the NIH Computer Center* for this message and associated codes.

10.2.3 Tape Data Set Security

Tape data set security on Titan is handled by RACF permissions on a data set rather than volume basis. Data set protection will depend on the RACF profiles in place and will apply to any data set, regardless of whether it is on tape or disk. Users may need to modify their RACF profiles to provide the correct level of access to tape data. For RACF processing on the Web, go to:

http://titan.nih.gov

and select RACF.

If an agency wishes to continue the use of the former North system tape naming conventions of aaa.iii.dataname, the RACF coordinator should create RACF profiles of the form aaa.iii.** and should permit the $iii USERid ALTER access to that profile. Optionally, the RACF coordinator can set the owner for the aaa.iii.** RACF profile as $iii. This will allow the $iii user to use RACF commands to permit other users access to data sets on tape. Unless these RACF permissions are given, the generic profiles currently in use for disk will be used on Titan and some tape jobs may fail.

10.2.4 Tape Standards

The standard recording mode for NIH Computer Center library cartridge tapes is 18 track, 38000 bpi. Refer to *Batch Processing and Utilities at the NIH Computer Center* for the specifications for the label parameters and options, and a list of the parameters required for tape processing. All tape data set names must conform to standards as specified in Section 10. All tapes that are not under the control of TMS must be processed as foreign tapes.

Recreating Tape Data Sets

When recreating a data set on a specific cartridge tape volume, the user must observe the following rules:

- The same data set name must be used. Only when the data set name on the DD statement matches the data set name on the cartridge tape label will the expiration date be ignored and TMS allow the file to be overwritten.
- DISP=OLD must be specified. (DISP=NEW is used exclusively for requesting a scratch volume to create a new data set or adding a new data set to an existing cartridge tape volume).

If both of the above conditions are not met in recreating a data set on a specific volume, a "scratch" volume will be used, and the only indication that this has occurred is in the JES2

Job Log at the start of the job output. For a multiple data set tape, the only data set that can be recreated is the last one.

Bypass Label Processing (BLP)
The use of bypass label processing (BLP), a subparameter of the LABEL=, is not allowed for Titan. Users processing foreign tapes must ensure that the tape has been created as non-labeled or with IBM standard labels. Users must also ensure that the supplier provides the data set name, density, record format, record size, and block size.

If any difficulties are encountered in processing the tape, the user should then contact TASC for further assistance.

10.2.5 Tape Inventory Management

Users can access the tape database for tape management (displaying information, extending expiration dates, cataloging and uncataloging, or scratching tape data sets) through ISPF Option L.4.

Titan users can run tape listing reports from the Web using SILK (Secure Internet-LinKed) Web technology. Tape reports can be run for an entire agency code or an individual userid. Go to:

http://titan.nih.gov

and select "Titan Utilities" and then "Tape Inventory."

10.2.6 Removal of Tapes

Tapes in the VSM may not be removed from the NIH Computer Center. If you need to check out a tape that has a serial number above 500000, you must first copy it to a standard 3480 tape cartridge for removal (purchase). Users may provide their own 3480 tapes or purchase them from CIT.

In order to remove non-VSM tapes, users must obtain property passes from their administrative officer prior to the close of the business day. CIT will not issue property passes for tapes.

10.2.7 TAPEMAP for Foreign Tapes

TAPEMAP is used to display the format of the volume, header, and trailer labels of a standard-labeled or unlabeled tape for one or more data sets on a foreign tape. Appropriate messages are printed for error conditions such as I/O errors, data checks, incorrect density, tape marks embedded in data, and missing labels.

Required Symbolic Parameters

TAPE Supplies the volume serial number of the tape from which the data is being mapped.

DRIVE Supplies the unit type of the tape device being used.

Optional Symbolic Parameters

DSNUM=ALL Maps all data sets on the tape.

For example, to map and scan all the data sets on a tape:

```
//stepname EXEC TAPEMAP,
//   TAPE=tapeser,DRIVE=FRGN3480,DSNUM=ALL
```

10.3 BACKUP/RECOVERY FOR DISTRIBUTED DATA

The NIH Backup and Recovery Service (NBARS), using TSM (Tivoli Storage Manager) client software, allows NIHnet-connected users to back up and recover data stored on LAN servers and desktop computers. TSM clients are available for a variety of platforms, including Windows, Windows 95, NT, Macintosh, Unix, and Linux. This backup/recovery service for distributed data provides an economical, secure, reliable, central mechanism for backing up and restoring data across interconnected LANs, without manual intervention by users. Backed up files are stored and protected in the secure NIH Computer Center facility on a combination of high-capacity disks and tapes. Features of this automatic backup system include:

- automatic scheduled backup on predetermined schedule
- user-initiated backup on "demand"
- rapid recovery, day or night
- easy specification of what files to back up and how many versions to keep.
- incremental backups that copy only the files that have changed since the last backup
- "point and click" file recovery
- graphical user interface
- secure and inexpensive storage
- no limit on size or location of groups
- online tutorial

- administration through a Web browser
- backup status notifier client software

There are several ways to become a user of the NIH Backup and Recovery Service:

- If there is already a custom policy domain established for your workgroup or LAN, and the administrator for that domain approves, you may join that domain without any registration. You do not need a CIT USERid to join a custom domain. The administrator for that domain will assign your node name and backup schedule. If you need help determining if there is an existing custom domain for your group, or have trouble contacting its local administrator, please call TASC.
- If there is no existing custom policy domain for your group, you can set up a new custom domain with yourself as administrator.
- You can register your computer for the "NBARS public policy domain" by using the form on the NBARS Web site. Because of billing requirements, you must have one of the following: a Titan USERid, a CIT account/initials combination (South System) or a Helix ID registered in your name to join this public domain. As a member of the NBARS public policy domain, you will use the default backup parameters defined for NIH, and you may choose from a selection of pre-defined backup schedules. When your registration is complete, you will be sent your assigned node name via e-mail.

For more information, online registration for NBARS, or free client software, visit the World Wide Web site:

http://silk.nih.gov/silk/nbars

11 HARDWARE FACILITIES

This section describes the equipment at the central facility, including the OS/390 Enterprise System and the Enterprise Open Systems (Unix-based), and information concerning other hardware devices used to access the central complex.

11.1 CONFIGURATION - OS/390 SYSTEMS

The OS/390 Titan component of the NIH Computer Center is an integrated computing facility composed of multiple processors interconnected by over 400 volumes of shared direct access storage and common operating system software. The system has a complement of peripheral devices that include tape drives, communications controllers, and electrographic printing subsystems.

Where possible, the peripheral devices can be manually switched to one or more of the processors. Many devices are also accessed through multiple data channels within a processor. This switching and multiple channel access allow for minimal disruption of service in the event of a subsystem or component failure.

A summary of the major hardware components exercised at the NIH Computer Center follows; additional information may be obtained from the *IBM ESA/390 Principles of Operation*, SA22-7201 and in the various component description manuals. Refer to the hardware and software information at the back of each issue of *Interface* for the current central processor identification numbers. A hardware list for the IBM OS/390 Titan System includes the following:

Model	**Item Description**
9672-RB6	Central Processing Units
ILK 3762	Ethernet Interface for TCP/IP
RAMAC (9392)	Direct Access Storage Device
3480	Cartridge Tape Drives (18 track, 38,000 BPI)
3490E	Cartridge Tape Drives (36 track, 38,000 BPI)
3494	Automated Tape Library
3422	Tape Drives (6250/1600 BPI)
STK VTSS	Virtual Tape Storage Subsystem
STK 9840	Ultra High Performance Magnetic Tape Drives
3990	DASD Cache Storage Controllers
9390	DASD Cache Storage Controllers
3900	Laser Printing Subsystems
3160	Cut-sheet Laser Printers
4245	Impact Printers
3172	Channel to Ethernet Interface
3745	Communications Controllers
NCR 5665	Communications Controller System
STK 9310 (Powderhorn)	Automated Tape Library (Silo)
STK 9490 (Timberline)	Cartridge Tape Drives (36 track, 38,000 BPI)

11.1.1 External Device and Channel Specifications

The central processors may have a great variety of external devices attached including tape drives, disk drives, printers, and terminals. Data going between the processor complex and the external device passes through a logical path called a channel. Channels are the direct controllers of all input/output devices. They provide the capability of reading or writing data at the same time that actual computing is taking place by relieving the processor complex of the task of communicating directly with the device.

11.1.1.1 Direct Access Device Specifications

9392-B13 RAMAC Disk Storage (logical 3390**)**

- 50,085 tracks/logical volume
- 15 tracks/cylinder
- 3,339 cylinders/logical volume
- 56,664 bytes/track
- 849,960 bytes/cylinder
- 2.838 gigabytes/logical volume

11.1.1.2 Magnetic Tape Device Specifications

3480 Magnetic Tape Subsystem

- tape cartridge
- 18 parallel tracks
- 38,000 bytes/inch recording density
- high speed search
- 3 million bytes/second data transfer rate
- dynamic error recovery techniques

3490E Magnetic Tape Subsystem

- cartridge tape and enhanced capacity cartridge tape
- 36 track recording format
- 76,000 bytes/inch data density
- high speed search
- 4.5 MB per second data transfer rate
- resident error-recovery procedures
- Improved Data Recording Capability (IDRC) feature

3422 Tape Subsystem

- 125 inches/second tape speed
- 6250/1600 bytes/inch recording density
- 3 million bytes/second data transfer rate
- 3 inch inter-block gap (6250BPI
- 6 inch inter-block gap (1600BPI)

9840 Magnetic Tape Drives

- cartridge tape system - dual-reel inside the cartridge; tape is always enclosed
- tape load point - at the middle of the tape for faster loading and searching
- cartridge external physical form factor - same as 3490E and 3480 cartridges
- 20GB uncompressed cartridge capacity - up to 80GB for highly compressed data
- tape speed - read/write 79 inches per second (IPS); rewind - 315 IPS
- up to 20MB/second data rate for compressed data
- ESCON channel connected to IBM OS/390 systems
- mostly located within StorageTek Automated Tape Libraries
- separate control unit for each tape drive

11.1.1.3 Output Device Specifications

3900 Wide Advanced Function Continuous Form Printer

- all-points addressable printing
- 229 pages/minute
- multiple fonts
- graphics capability
- variable spacing
- standard paper size of 11" x 8 1/2" (without easy-strip margins)

3160 Electrophotographic Cut-sheet Laser Printer

- all-points addressable printing
- low-power laser electrophotographic print technology
- speeds of up to 60 impressions per minute in either simplex or duplex mode
- landscape (11 x 8 ½ inch) or portrait (8 ½ x 11 inch mode on cut-sheet forms with a 3-hole punch option
- resolution of 600 x 600 picture elements (pels)

4245 Impact Printer

- 132 characters/line
- 2000 lines/minute (max) depending on print train use
- 6 or 8 lines/inch vertical spacing
- SN10 character set
- continuous forms

11.1.2 Remote Printers and Workstations

RJE workstations offer a secure method of connecting to the NIH Computer Center from the user's office or laboratory.

A wide variety of bisynchronous workstations have been used as RJE workstations connected to the NIH Computer Center. In general, a bisynchronous workstation that is compatible with any IBM model RJE workstation can be used for remote printing and job entry.

CIT recommends the BARR/HASP Remote Job Entry Workstation package as a convenient and cost effective method of connecting to the NIH Computer Center to submit jobs and data from a remote location and to receive data and printed output at a remote location. BARR/HASP consists of a communications card and program that operates on DOS-based software. BARR/HASP supports the attachment of printers of many different speeds and prices. Users can call TASC for further information.

Printers that are part of the SNA network can be defined as remote RJE printers. Call TASC to request that a particular printer be defined (you must know the VTAM node name of the printer).

For additional information, contact TASC.

11.2 ENTERPRISE OPEN SYSTEM (UNIX) CONFIGURATION

The hardware for the Enterprise Open Systems includes:

- Compaq AlphaServer GS60
  - 4 CPUs (500 MHz EV6)
  - 4 GB RAM

- Compaq/Digital AlphaServer GS140
  - 10 CPUs (440 MHz)
  - 8 GB RAM

- Numerous Compaq/Digital AlphaServers: 1000s, 1200s, 2100s, and a 4100
- Sun Enterprise 250 and 420-R servers

11.3 WINDOWS NT/2000 APPLICATION SERVERS

The NIH Computer Center has rack-mounted Compaq servers that meet minimum levels that CIT has determined to be required for data center-level robustness. CIT acquires and "builds" (configures) these servers and does not accept servers from other sources.

11.4 OTHER HARDWARE DEVICES

It is possible to acquire other types of hardware devices to be connected to or to communicate with the NIH Computer Center. Such hardware could include special displays, analog processors, and other special purpose devices. Contact TASC for further information.

Any user contemplating the acquisition of special hardware should write a memo to TASC when the project is being formulated. A meeting will be set up to discuss the feasibility of the request as it relates to the central facility. Points such as selection, acquisition, and costs of the hardware and related special control units will be covered. Most importantly, the software system needed to drive the special gear will be discussed in detail since any interaction with or demands on the NIH Computer Center staff or the operating system of the central facility must be carefully evaluated. No special gear will be tied into the central facility until all such details have been fully resolved.

INDEX

Titan User's Guide

Document Evaluation

Is the Manual:

	YES	NO
Clear?	☐	☐
Well organized?	☐	☐
Complete?	☐	☐
Accurate?	☐	☐
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